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CITY
ARITHMETICS
—
BOYLAN-SMITH

FIFTH YEAR - FIRST HALF

NEW YORK
CHARLES E. MERRILL CO.

Edw T 119.16.230



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CITY ARITHMETICS

FIFTH YEAR: FIRST HALF

BY

WILLIAM A. BOYLAN

DISTRICT SUPERINTENDENT OF PUBLIC SCHOOLS
CITY OF NEW YORK

AND

FLOYD R. SMITH

PRINCIPAL OF PUBLIC SCHOOL 167, BROOKLYN



CHARLES E. MERRILL COMPANY
NEW YORK AND CHICAGO

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PREFACE

ONE noticeable weakness in elementary education of to-day is the pupil's inability to use a textbook correctly. The CITY ARITHMETIC is an effort to remove this weakness. The appeal is first and foremost to the pupil. The language used is within his comprehension; the explanations are such as he can easily grasp. The work advances step by step. The drill is ample and sufficiently varied, and the problems are within the experience of the average child. These are books which the pupils can use at home as well as in school.

Business men complain that boys and girls whom they employ cannot perform correctly the four fundamental operations. Teachers in the upper grades state that the pupils come to them so weak in addition, subtraction, multiplication, and division of integers that the work in the last three years is seriously handicapped. The authors feel that this is in part due to lack of persistent drill. To offset this, a large number of examples and problems in these operations has been furnished for daily practice.

Overemphasis on the explanation of processes and excessive variety of appeal to the interest of pupils are other causes of weakness in arithmetic. The authors have striven to avoid refinements of explanation, to eliminate processes with little practical application, and to provide an intelligent but not excessive variety of drill work.

Every teacher knows how heavy a burden is the organization of material. These books lift the burden. A moderate spiral is used. In the third and fourth years, the work has been arranged by weeks and with the greatest care. In the fifth and sixth years, the work has been arranged by months; in the seventh and eighth years, the arrangement is topical. Easy examples have been selected for the beginning of each term and the matter is presented in a way that avoids the usual stumblings and discouragements.

Type problems for each grade have been given to illustrate how particular methods are to be carried out and to show with how much detail each subject is to be presented.

Ample material for oral drill has been furnished, and a great number of examples and problems has been introduced so that teachers may lay stress on any phase of the work that requires emphasis. How many of these examples and problems are to be worked by the class, the teacher herself may decide, according to the needs of the pupils.

PLAN OF WORK

THE work of the first half of the fifth year is arranged in quarters.

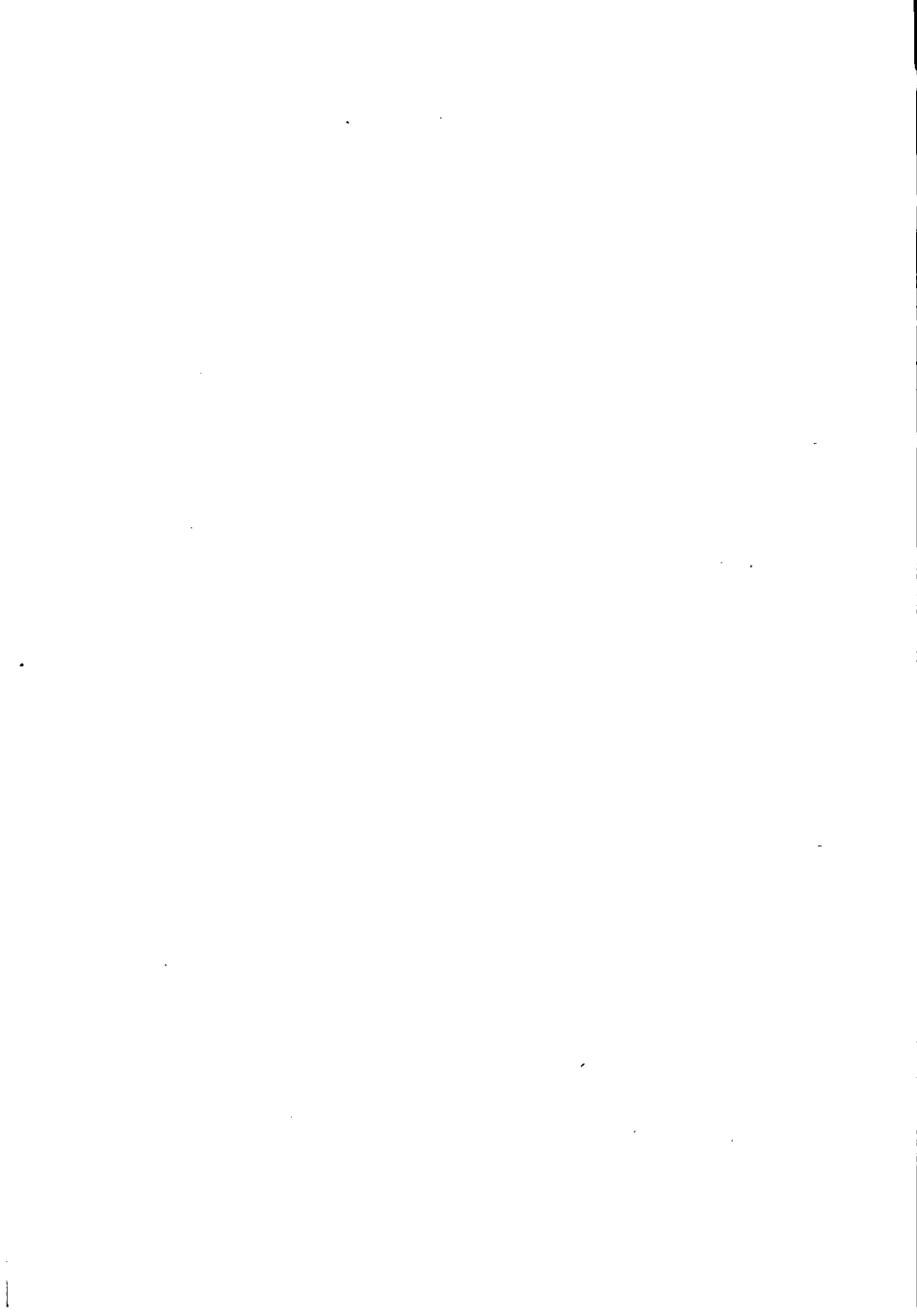
The special features of the first quarter are: addition and subtraction of fractions whose denominators cannot be determined by inspection, cancellation, approximate answers, and bills of three or four articles purchased at one time. The special feature of the second quarter is multiplication of fractions. In the third quarter, denominate units, the sequence of signs, and the indicating of operations receive attention. Division of fractions is the special work of the fourth quarter.

At the beginning of each quarter, there is a review of the work of previous grades. Daily review is recommended, but the new work of the grade should not be postponed until these review exercises have been finished. In fact, the new work should be begun on the first day of the term.

Besides a great number of oral and written problems, twenty groups of related problems have been introduced. The topics—such as The Class in Cooking, The Class in Sewing, A Walking Club, Making Hats, and Buying Coal—are all within the experience and interest of pupils in the fifth year. An effort has been made to avoid artificiality in the treatment of these subjects.

The teacher should not limit the work in approximate answers and indicating operations to the exercises which are given in the first and third quarters. She should encourage her pupils to apply these methods in subsequent problems. Pupils should also be encouraged to tell in problems (1) what is given, (2) what is required, and (3) what arithmetical processes are necessary for solution.

In this, as in the other books of the series, the language used is within the comprehension of the pupil, the explanations are such as he can easily grasp, the work advances step by step, and the oral work is ample and sufficiently varied.



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FIFTH YEAR: FIRST HALF

FIRST QUARTER

READING NUMBERS

To read numbers more easily we separate them into groups or periods of three figures each.

Counting from the right, the first period is the **units'** period; the second, the **thousands'** period; the third, the **millions'** period; the fourth, the **billions'** period.

George Brown is 6 feet tall. He is 46 years old.

He lives in Chicago, Illinois, 900 miles from New York.

Illinois contains 56,665 sq. mi. Its population is 5,638,591.

The population of the United States in 1910 was 91,972,266.

The United States has thus far spent for pensions \$4,895,475,637.

BILLIONS			MILLIONS			THOUSANDS			UNITS		
Hundred-billions	Ten-billions	Billions	Hundred-millions	Ten-millions	Millions	Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Units
					5		5	6		4	6
				9	1	6	3	8	9	0	6
						9	7	2	6	6	5
									5	9	1
									2	6	6
									6	3	7
	4		8	9	5	4	7	5			

In the table on page 9 (beginning at the top line), 6, 46, and 900 are in the units' group or period. We do not use the name of the period in reading the units' group. We say 6, not 6 units; 46, not 46 units; 900, not 900 units.

900 has no units or tens. Whenever any part of a number is lacking, we fill the place with a naught.

In the number 56,665, the figures 56 are in the thousands' period, and 665 in the units' period.

Notice that we use the name of the period in reading *56 thousand*.

In the number 5,638,591, the first 5 is in the millions' period. Read 5,638,591. Read 91,972,266.

In the number 4,895,475,637, the first 4 is in the billions' place. Read the number.

5,735,639 is read "five million, seven hundred thirty-five thousand, six hundred thirty-nine."

Never use the word *and* to connect the parts of whole numbers.

Use the singular, not the plural, in reading whole numbers. Say "six million," not "six millions."

Columbus discovered America in 1492. *1492* denotes a year and is written without a comma. It is read "fourteen hundred ninety-two" or "fourteen ninety-two."

1. Oral Exercises.

1. Read:

9,000,000	63,747,000	1,397,000,000
25,000,261	90,207,308	1,256,706,000

Read the following:

2. The population of the State of New York is 9,113,279.

3. The population of Nevada is 81,875.
4. The population of Indiana is 2,700,875.
5. \$89,367,000.15.
6. In 1523 Magellan ended his first voyage around the world.
7. The population of Canton, China, is 900,000.
8. The population of Philadelphia is 1,549,008.
9. In 1609 Henry Hudson discovered the Hudson River.

WRITING NUMBERS

2. Written Exercises.

In writing numbers in figures, we divide the periods by commas.

Write:

1. Five million, seven hundred sixty-seven thousand, four hundred thirty-nine.
2. Ninety-five million, eight hundred nine thousand, three hundred fifty-seven.
3. Two hundred thirty-seven million, eight thousand, nine hundred nine.
4. Six hundred seventy million, nine hundred thousand, five hundred sixty.
5. Nine billion, nine hundred sixty-five million, three hundred seventy-one thousand, four hundred eighty-seven.
6. Write the present year in Roman numbers.

Write the numbers in the following sentences:

7. The population of Berlin is two million, seventy thousand, six hundred seventy-five.
8. The population of Virginia is two million, sixty-one thousand, six hundred twelve.
9. One hundred billion is a number very seldom used.

COUNTING**3. Oral Exercises.**

1. Beginning with 5, count by 6's to 101.
2. Beginning with 6, count by 7's to 104.
3. Beginning with 7, count by 8's to 103.
4. Beginning with 8, count by 9's to 107.

ADDITION**4. Oral Exercises.**

Add 44 and 29.

Add 44 and the tens' figure of the second addend: $44 + 20 = 64$. Then add the units' figure of the second addend: $64 + 9 = 73$. Think 44, 64, 73.

44	38	27	16	59	61
58	60	43	25	52	46
37	48	26	19	15	54
55	48	34	56	45	35
33	39	42	17	53	49
47	24	57	18	29	36

To each of the numbers in the above table, add each of the following: 29, 38, 37, 26, 35.

5. Written Exercises.

Mr. Howe paid \$26,000 for a house. He spent \$2,386.30 for repairs; \$875.75 for furniture; \$217.53 for curtains; \$687.53 for carpets; and \$375 for a piano. How much did Mr. Howe spend in all?

\$26,000

2,386.30

875.75

217.53

687.53

375\$30,542.11 *Ans.*

Write dollars under dollars, cent point under cent point, and cents under cents.

In adding dollars and cents, place \$ before the first addend and before the answer.

In adding, group by tens when possible; *e.g.*, in the units' column think 6, 11: write 1. Carry 1 to the tens' column and think 11 (grouping the two 5's), 21 (grouping the 7 and 3).

To find the answer, add upward. To test the answer, add downward.

How many of the following examples can you add correctly in 10 minutes?

1. 37,672

72,438

9,650

834

14,156

57,658

25,073

60,506

2. \$ 565.75

905.60

870.95 $\frac{1}{2}$

248.09

77.91

633.67

1,998.92

72.19 $\frac{1}{2}$

3. 783

59,327

67,806

50,095

5,760

675

133,864

95,006

Add:

4. One hundred twenty-nine thousand three hundred fifty-four,

Two hundred seven thousand six hundred nine,

Eighty-eight thousand one,

Five hundred sixty-two thousand four hundred eight and one third,

Four hundred sixteen thousand three hundred forty-seven and one third,

Five hundred sixty-three and one third,

One thousand nine hundred sixty-five,

Seven hundred eighty-two thousand seven hundred sixty-four,
Two hundred thirty-two thousand three hundred forty-six,
One hundred thousand two hundred nine.

5. Four thousand three hundred seventy-nine dollars and thirty-six cents,

Six thousand thirty-eight dollars and seventy-four cents,

Eight thousand one hundred nineteen dollars and six cents,

Nine thousand twenty-seven dollars and sixty-three cents,

Five thousand four hundred nine dollars and seventy-three cents,

Four thousand sixty-nine dollars and thirty-five cents,

Three thousand two hundred fifty-seven dollars and nineteen cents,

Five thousand three hundred forty-eight dollars and twenty-one cents,

Nineteen dollars and sixty-four cents,

Nine dollars and thirty-six cents.

6. \$ 376.43	7. \$ 174.35	8. \$ 675.55
130.75	2,560.74	134.54
706.07	12,232.91	56.71
481.63	5,055.67	1,252.47
967.35	134.16	862.75
83.65	86.34	95.35
9.37	910.50	734.63
1,121.13	33.72	36.42
<u>708.86</u>	<u>6.06</u>	<u>167.44</u>

Add:

9. One million six hundred seventy-two thousand three hundred five,

Four million two hundred sixty-eight thousand seven hundred five,

Five million six hundred thirty-three thousand two hundred forty-two,

One million seven hundred twenty-seven thousand sixty-seven,

Two million five hundred thirteen thousand three hundred seven,

Eight million two hundred sixty-two thousand three hundred thirty-three.

10. Three million two hundred sixty-five thousand seven hundred eighty-two,

One million five thousand three hundred seventy-eight,

Four million nine hundred four thousand six hundred seven,

Two million six hundred fifty-six thousand four hundred four,

Five million two hundred thirty-three thousand one hundred thirty-six,

One million five hundred eleven thousand two hundred,

Three million two hundred sixty-four thousand five hundred seven.

11. Mr. Black deposited in the bank the following sums of money:

January	\$ 387.50
February	2,109.75
March	516.10
April	1,100.80
May	65.25

How much did he deposit in these 5 months?

12. Find the total population of the following states:

Maine	742,371
New Hampshire	430,572
Vermont	355,956
Massachusetts	3,336,416
Rhode Island	542,610
Connecticut	1,114,756

13. Find the combined population of the 5 largest cities in the world:

New York, 5,253,885 London, 4,522,964 Paris, 2,888,110
Chicago, 2,393,325 Berlin, 2,071,257

14. IMMIGRATION INTO THE UNITED STATES

YEAR	NUMBER OF IMMIGRANTS
1908	782,870
1909	751,786
1910	1,041,570
1911	878,587
1912	838,172
1913	1,197,892
1914	1,218,480
1915	326,700

Find the total immigration into the United States during these eight years.

15. 5,672,617	16. \$37,362.16	17. 4,338,764
338,473	18,728.94	2,762,536
157,909	15,604.22	606,815
406,121	32,165.81	19,342
215,500	23,247.06	450,761
321,063	51,673.14	215,509
444,307	32,234.33	895,314
232,612	47,363.71	601,006
<u>890,126</u>	<u>2,741.19</u>	<u>431,792</u>

Add:

18. Three million four hundred fifty-two thousand five hundred twelve,

Four million six hundred fifty-three thousand five hundred ninety-one,

Six million three hundred twenty-seven thousand two hundred thirty-seven,

Two million two hundred thirty-five thousand five hundred four,

Five million eight hundred seventy-five thousand five hundred sixteen,

One million two hundred thirty-two thousand four hundred thirty-four,

Three million six hundred thirty-eight thousand two hundred seventy,

Two million six hundred fifteen thousand eight hundred fifteen.

19. Twenty-three thousand three hundred fifty-four dollars and sixty-five cents,

Eighty-one thousand two hundred forty-three dollars and sixteen cents,

Seventeen thousand three hundred four dollars and twenty-four cents,

Nine thousand fifty dollars and twenty-five cents,

Five thousand six dollars and one cent,

Twenty-two thousand three hundred fourteen dollars and thirty-four cents,

One thousand seven hundred eighty-six dollars and twenty-three cents,

Thirty-nine thousand one hundred thirty-two dollars and sixty-seven cents,

Fifteen thousand three hundred seventy-one dollars and forty-five cents,

Two thousand five hundred sixty-three dollars and thirty-five cents.

20. Seventy-nine dollars and sixty-three cents,

One hundred eight dollars and thirty-seven cents,

Four hundred seven dollars and four cents,

Five hundred eighteen dollars and ninety cents,
 Three hundred seventy-nine dollars,
 Eight hundred sixty-eight dollars and sixty-six cents,
 Seven hundred sixty-nine dollars and forty-three cents,
 Nine hundred forty-seven dollars and thirty-two cents,
 Five hundred eighteen dollars and seventy-five cents.

SUBTRACTION

6. Oral Exercises.

Tell how much change from a dollar is due after making the following purchases. Subtract first from the next ten and then from the dollar.

Take 33¢ from \$1.00.

33¢ and how many cents make 40¢? 7¢

40¢ and how many cents make \$1.00? 60¢

Think 7¢, 60¢, 67¢.

53¢	34¢	44¢	61¢	59¢
42¢	66¢	77¢	39¢	62¢
31¢	74¢	63¢	24¢	84¢
22¢	51¢	37¢	68¢	69¢
55¢	28¢	57¢	56¢	82¢

7. Written Exercises.

Mr. Duke bought a house for \$9,850.50 and sold it at a loss of \$975.75. What was the selling price?

Write \$ before the minuend and before the remainder.

\$9,850.50

975.75

\$8,874.75 *Ans.*

Test by adding together the remainder and the subtrahend. If the sum of the remainder and the subtrahend is equal to the minuend, the subtraction is correct.

1.	\$9,473.64	2.	1,563,879	3.	\$573,067.38
	<u>— 1,562.73</u>		<u>— 1,372,969</u>		<u>— 81,045.42</u>

4. If the minuend is four million seven hundred eighty-five thousand three hundred fifty-one and the subtrahend is two million nine hundred sixty-six thousand one hundred thirty-nine, what is the remainder?

5. From thirty-six thousand seven hundred twenty-six dollars and fifty-four cents subtract sixty-eight cents.

6. In 1860 the population of the United States was 31,443,321. In 1910 the population was 91,972,266. What was the increase in these 50 years?

7. The area of Massachusetts is 8,266 sq. mi. The area of Pennsylvania is 45,126 sq. mi. How much larger than Massachusetts is Pennsylvania?

8. The population of the City of New York is 5,253,885. The population of Chicago is 2,393,325. How much larger is the population of New York than the population of Chicago?

9. In 1860 the population of the City of New York was 1,174,779. In 1915 the population was 5,253,885. What was the increase in these 55 years?

10. The population of London is 4,522,964. The population of the City of New York is 5,253,885. How much greater than the population of London is the population of the City of New York?

Name and supply the missing terms :

11.	765,232	12.	?	13.	5,437,609
	<u>— ?</u>		<u>— 1,254,376</u>		<u>— 1,528,118</u>
	57,131		2,164,185		?

Find the missing numbers :

$$\begin{array}{r} 14. \quad 57,632 \\ + \quad ? \\ \hline 94,561 \end{array}$$

$$\begin{array}{r} 15. \quad ? \\ + 77,864 \\ \hline 109,782 \end{array}$$

MULTIPLICATION

8. Oral Exercises.

1. Multiply each number from 1 to 50 by 2.
2. Multiply each number from 1 to 33 by 3.
3. Multiply each number from 1 to 25 by 4.
4. Multiply each number from 1 to 20 by 5.
5. Give answers at sight :

6×90	12×60	7×80	12×90
6×70	7×120	8×120	8×90
12×40	8×60	9×70	11×70
11×12	9×90	11×10	5×90

9. Written Exercises.

How much did Mr. Harris pay for 309 yards of cloth at \$2.69 a yard?

$9 \times 269 = 2421$. Write 1, the right-hand figure of the partial product, under 9, the multiplying figure.
 $3 \times 269 = 807$. Write 7, the right-hand figure of the second partial product, under 3, the multiplying figure.
 In the product mark off two places beginning at the right.

$$\begin{array}{r} 2.69 \\ 309 \\ \hline 2421 \\ 807 \\ \hline \$831.21 \end{array}$$
Ans.

Test the answer by multiplying 309 by 2.69.

1. $4,363,572 \times 4$
2. $26,617,784 \times 5$
3. $\$69,168.35 \times 3$
4. $\$319,689.87 \times 6$

Multiply :

5. $\begin{array}{r} 146,523 \\ \underline{207} \end{array}$	8. $\begin{array}{r} \$865.05 \\ \underline{760} \end{array}$	11. $\begin{array}{r} 7,328 \\ \underline{1,090} \end{array}$	14. $\begin{array}{r} \$750.42 \\ \underline{2005} \end{array}$
--	---	---	---

6. $\begin{array}{r} \$5,087.56 \\ \underline{309} \end{array}$	9. $\begin{array}{r} 9,573 \\ \underline{2,340} \end{array}$	12. $\begin{array}{r} \$578.73 \\ \underline{8060} \end{array}$	15. $\begin{array}{r} 6,308 \\ \underline{5,672} \end{array}$
---	--	---	---

7. $\begin{array}{r} 78,643 \\ \underline{980} \end{array}$	10. $\begin{array}{r} \$307.42 \\ \underline{9280} \end{array}$	13. $\begin{array}{r} 9,726 \\ \underline{1,008} \end{array}$	16. $\begin{array}{r} \$371.95 \\ \underline{2487} \end{array}$
---	---	---	---

$$\begin{array}{r} 17. 15,746 \\ \underline{563} \end{array}$$

$$\begin{array}{r} 18. \$360.57 \\ \underline{9269} \end{array}$$

DIVISION

10. Oral Exercises.

1. Divide each of these numbers by 2: 30, 38, 46, 52, 56, 64, 68, 74, 86, 98.

2. Divide by 3: 39, 42, 48, 54, 57, 69, 72, 78, 84, 93.

3. Divide by 4: 56, 60, 72, 84, 92, 88, 96, 68, 76, 100.

4. Give quotients :

$$6 \overline{)73}$$

$$8 \overline{)99}$$

$$9 \overline{)112}$$

$$10 \overline{)290}$$

$$11 \overline{)132}$$

$$11 \overline{)121}$$

$$12 \overline{)89}$$

$$7 \overline{)81}$$

$$5 \overline{)200}$$

$$6 \overline{)70}$$

11. Written Exercises.

A dealer received \$485.75 for 67 cords of wood. How much did he charge per cord?

$ \begin{array}{r} \$7.25 \text{ Ans.} \\ 67 \overline{) \$485.75} \\ \underline{469} \\ 167 \\ \underline{134} \\ 335 \\ \underline{335} \\ 0 \end{array} $	Write the cent point of the quotient over the cent point of the dividend. $485 \div 67 = 7$. Write the 7 in the quotient over 5, the right-hand figure of the first partial dividend. $67 \times 7 = 469$. $485 - 469 = 16$. Bring down 7 from the quotient. $167 \div 67 = 2$. Write the 2 in the quotient over 7, the right-hand figure of the second partial dividend. $67 \times 2 = 134$. $167 - 134 = 33$. Bring down 5 from the quotient.
--	---

$335 \div 67 = 5$. Write 5 in the quotient over 5. $67 \times 5 = 335$.

Test the answer by multiplying the quotient (7.25) by the divisor (67). If the product is the same as the dividend (485.75), the division is correct.

- | | |
|----------------------------|-------------------------------|
| 1. 9,546,855 $\div$ 6 | 11. 55,783,656 $\div$ 27 |
| 2. \$8,439.54 $\div$ 6 | 12. \$1,667,835.84 $\div$ 258 |
| 3. \$15,746.43 $\div$ 7 | 13. 121,489,584 $\div$ 39 |
| 4. 9,856,764 $\div$ 7 | 14. \$1,796,591.76 $\div$ 348 |
| 5. \$54,238.72 $\div$ 8 | 15. 92,376,486 $\div$ 81 |
| 6. 44,786,958 $\div$ 9 | 16. 87,543,673 $\div$ 49 |
| 7. 2,693,788 $\div$ 24 | 17. 3,492,606 $\div$ 26 |
| 8. \$764,884.89 $\div$ 231 | 18. 7,830,615 $\div$ 65 |
| 9. 43,783,982 $\div$ 32 | 19. 12,678,624 $\div$ 1,248 |
| 10. \$58,984.74 $\div$ 342 | 20. 32,842,832 $\div$ 15,632 |

REDUCTION OF FRACTIONS

1, 2, 5, 11 are whole numbers or **integers**.

$\frac{1}{2}$, $\frac{2}{3}$, $\frac{5}{8}$ are **fractions**, because they are one or more of the equal parts of a unit.

To give you $\frac{4}{5}$ of a pie, I must cut the pie into 5 equal parts and give you 4 of these parts.

In $\frac{4}{5}$, the number below the line is called the **denominator**.

The denominator of a fraction tells into how many equal parts the unit has been divided. It names the parts.

In $\frac{4}{5}$, the number above the line is called the **numerator**.

The numerator of a fraction tells the number of parts taken.

The numerator and the denominator of a fraction are the **terms** of the fraction.

12. Oral Exercises.

1. Find $\frac{1}{5}$ of 10¢. $\frac{2}{10}$ of 10¢.

$\frac{2}{5}$ of 10¢. $\frac{4}{10}$ of 10¢.

$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
Unit									

$$2. \frac{1}{5} = \frac{?}{10}$$

$$\frac{2}{5} = \frac{?}{10}$$

$$\frac{3}{5} = \frac{?}{10}$$

$$\frac{4}{5} = \frac{?}{10}$$

$$\frac{2}{10} = \frac{?}{5}$$

$$\frac{4}{10} = \frac{?}{5}$$

$$\frac{6}{10} = \frac{?}{5}$$

$$\frac{8}{10} = \frac{?}{5}$$



3. To give you $\frac{1}{5}$ of a pie, into how many equal parts must I cut the pie? How many of these parts must I take?

4. To give you $\frac{2}{10}$ of a pie, into how many equal parts must I cut the pie? How many of these equal parts must I take?

5. Which would you rather have: $\frac{1}{5}$ of a pie, or $\frac{2}{10}$ of a pie?

6. In $\frac{2}{10}$ of a pie, which number shows into how many equal parts the pie is divided? What is this number called? Which number shows how many of the equal parts have been taken? What is this number called?

7. $\frac{2}{10}$ and $\frac{1}{5}$ are the same in value, but are expressed in different terms.

$$\frac{1}{5} = \frac{?}{10}$$

$$\frac{1 \times 2}{5 \times 2} = \frac{2}{10}$$

When we multiply the numerator and the denominator of a fraction by the same number, we change the fraction to higher terms but we do not change the value of the fraction.

$\$ \frac{1}{2}$ has the same value as $\$ \frac{2}{4}$.

$\frac{1}{3}$ of a tub of butter is as much as $\frac{2}{6}$ of the same tub.

8. Give answers:

$$\frac{1}{2} = \frac{?}{14}$$

$$\frac{1}{3} = \frac{?}{15}$$

$$\frac{2}{3} = \frac{?}{15}$$

$$\frac{1}{4} = \frac{?}{16}$$

$$\frac{2}{4} = \frac{?}{16}$$

$$\frac{3}{4} = \frac{?}{16}$$

$$\frac{1}{5} = \frac{?}{20}$$

$$\frac{3}{5} = \frac{?}{20}$$

$$\frac{4}{5} = \frac{?}{20}$$

$$\frac{5}{5} = \frac{?}{20}$$

$$\frac{1}{7} = \frac{?}{21}$$

$$\frac{3}{7} = \frac{?}{21}$$

$$\frac{6}{7} = \frac{?}{21}$$

$$\frac{1}{2} = \frac{?}{24}$$

$$\frac{1}{3} = \frac{?}{24}$$

$$\frac{1}{9} = \frac{?}{27}$$

$$\frac{5}{9} = \frac{?}{27}$$

$$\frac{1}{3} = \frac{?}{30}$$

$$\frac{1}{3} = \frac{?}{32}$$

$$\frac{5}{8} = \frac{?}{32}$$

9. $4 \div 2 = 2$. 2 is a factor of 4.

$10 \div 2 = 5$. 2 is a factor of 10.

An exact divisor of a number is a **factor** of that number.

10. Name a factor common to 6 and 4. 9 and 6. 10 and 15. 14 and 21. 22 and 33.

11. To reduce $\frac{4}{10}$ to lowest terms, we divide the numerator and the denominator by 2, a factor common to both. We may say that we "cancel the 2's."

$$\frac{4}{10} = \frac{2}{5}$$

Dividing both terms of a fraction by the same number does not change the value of the fraction.

A fraction is in its **lowest terms** when its numerator and denominator have no common factor.

12. Reduce to lowest terms :

$\frac{4}{10}$	$\frac{6}{10}$	$\frac{8}{10}$	$\frac{3}{6}$	$\frac{2}{8}$	$\frac{6}{8}$
$\frac{3}{9}$	$\frac{6}{9}$	$\frac{3}{12}$	$\frac{6}{12}$	$\frac{8}{12}$	$\frac{9}{12}$
$\frac{10}{12}$	$\frac{10}{15}$	$\frac{12}{16}$	$\frac{14}{16}$	$\frac{2}{18}$	$\frac{3}{18}$
$\frac{9}{18}$	$\frac{16}{18}$	$\frac{5}{20}$	$\frac{10}{20}$	$\frac{15}{20}$	$\frac{7}{21}$

13. The fractions $\frac{1}{3}$, $\frac{3}{5}$, $\frac{5}{7}$, $\frac{3}{8}$, and $\frac{4}{9}$ cannot be reduced. Why? Name some other fractions that cannot be reduced.

13. Written Exercises.

In reducing fractions to lowest terms, remember that

When the units' figure of a number is an even number or 0, the number is exactly divisible by 2.

When the units' figure of a number is 5 or 0, the number is exactly divisible by 5.

When the units' figure of a number is 0, the number is exactly divisible by 10.

Reduce to lowest terms :

1. $\frac{38}{80}$	4. $\frac{40}{75}$	7. $\frac{75}{90}$	10. $\frac{55}{80}$	13. $\frac{45}{100}$	16. $\frac{48}{96}$
2. $\frac{72}{80}$	5. $\frac{56}{80}$	8. $\frac{90}{100}$	11. $\frac{90}{100}$	14. $\frac{60}{175}$	17. $\frac{35}{125}$
3. $\frac{34}{200}$	6. $\frac{65}{200}$	9. $\frac{35}{245}$	12. $\frac{90}{380}$	15. $\frac{62}{488}$	18. $\frac{75}{525}$

14. Oral Exercises.

1. $\frac{1}{3}$, $\frac{2}{5}$, and $\frac{7}{8}$ are **proper fractions**, because the value of each one of them is less than 1.

Name some other proper fractions.

2. If I divide a pie into 3 equal parts and give you 3 of these parts, how much of the pie do I give you?

3. Is $\frac{2}{3}$ less than 1?

4. Is $\frac{2}{3}$ a proper fraction?

5. Is $\frac{4}{3}$ a proper fraction?

6. A fraction whose numerator is equal to or greater than its denominator is an **improper fraction**.

$1\frac{1}{2}$ is a **mixed number**, because it contains an integer and a fraction.

7. Select the proper fractions and the improper fractions in the following. Give the reason for your selection in each case.

$$\frac{65}{72}$$

$$\frac{200}{200}$$

$$\frac{19}{18}$$

$$\frac{57}{91}$$

$$\frac{37}{12}$$

$$\frac{4}{9}$$

$$\frac{50}{50}$$

$$\frac{17}{16}$$

$$\frac{55}{87}$$

$$\frac{99}{100}$$

$$\frac{1}{500}$$

$$\frac{601}{600}$$

CHANGING INTEGERS OR MIXED NUMBERS TO IMPROPER FRACTIONS

15. Oral Exercises.

1. Change 1 to halves, to thirds, to fourths, to fifths, to twentieths, to hundredths.

2. Change 2 to fourths, to ninths, to twelfths.

3. Change 3 to fifths, to sixths, to sevenths.

4. Give answers:

$$5 = \frac{?}{?}$$

$$6 = \frac{?}{?}$$

$$8 = \frac{?}{?}$$

$$9 = \frac{?}{?}$$

$$10 = \frac{?}{?}$$

$$100 = \frac{?}{?}$$

$$120 = \frac{?}{?}$$

$$50 = \frac{?}{?}$$

5. Change $3\frac{4}{5}$ to an improper fraction.

$$1 = \frac{5}{5} \quad 3 = \frac{3 \times 5}{5} = \frac{15}{5} \quad \frac{15}{5} + \frac{4}{5} = \frac{19}{5}$$

6. Change to improper fractions :

$1\frac{1}{2}$

$2\frac{1}{9}$

$10\frac{4}{5}$

$3\frac{1}{3}$

$1\frac{5}{11}$

$12\frac{1}{4}$

$4\frac{1}{5}$

$7\frac{2}{5}$

$2\frac{2}{15}$

$5\frac{2}{3}$

$2\frac{5}{12}$

$4\frac{7}{20}$

$6\frac{1}{4}$

$3\frac{8}{7}$

$8\frac{3}{8}$

16. Written Exercises.

Change to improper fractions :

1. $22\frac{7}{9}$

6. $12\frac{7}{16}$

11. $7\frac{17}{20}$

2. $16\frac{7}{8}$

7. $8\frac{5}{24}$

12. $15\frac{11}{12}$

3. $35\frac{5}{7}$

8. $42\frac{3}{4}$

13. $27\frac{4}{5}$

4. $19\frac{5}{8}$

9. $37\frac{3}{8}$

14. $39\frac{2}{3}$

5. $14\frac{11}{14}$

10. $29\frac{9}{10}$

15. $16\frac{8}{15}$

CHANGING IMPROPER FRACTIONS TO INTEGERS OR MIXED NUMBERS

17. Oral Exercises.

1. In 8 half dollars, how many dollars are there?
2. In 12 quarter dollars, how many dollars?
3. In 6 half dollars, how many dollars?
4. In 5 quarter dollars, how many dollars?

5. Express the following as integers :

$$\begin{array}{ccccc} \frac{6}{3} & \frac{15}{5} & \frac{24}{8} & \frac{36}{9} & \frac{42}{7} \\ \frac{72}{8} & \frac{63}{9} & \frac{48}{4} & \frac{120}{10} & \frac{132}{11} \\ \frac{108}{12} & \frac{125}{5} & \frac{270}{9} & \frac{84}{12} & \frac{96}{8} \end{array}$$

6. Reduce $\frac{51}{7}$ to a mixed number.

There are $\frac{1}{7}$ in one unit. In 51 sevenths, there are as many units as 7 is contained times in 51, that is $7\frac{2}{7}$.

7. Change to an integer or a mixed number :

$$\begin{array}{ccccc} \frac{34}{11} & \frac{29}{9} & \frac{47}{5} & \frac{81}{9} & \frac{67}{8} & \frac{55}{6} \\ \frac{123}{10} & \frac{61}{12} & \frac{83}{20} & \frac{75}{5} & \frac{31}{15} & \frac{33}{18} \\ \frac{29}{14} & \frac{36}{18} & \frac{36}{17} & \frac{40}{19} & \frac{54}{25} & \frac{55}{28} \end{array}$$

18. Written Exercises.

Change to an integer or a mixed number :

$$\begin{array}{llll} 1. \frac{274}{11} & 4. \frac{175}{12} & 7. \frac{323}{15} & 10. \frac{256}{25} \\ 2. \frac{453}{40} & 5. \frac{165}{14} & 8. \frac{309}{17} & 11. \frac{459}{50} \\ 3. \frac{545}{16} & 6. \frac{459}{20} & 9. \frac{278}{9} & 12. \frac{255}{21} \end{array}$$

CANCELLATION

Division may be shown in 3 ways :

$$24 \div 6 = 4, \quad 6 \overline{)24}, \quad \text{and} \quad \frac{24}{6} = 4.$$

$$19 \times 5 \div 5 \text{ may be written } \frac{19 \times 5}{5}.$$

In $19 \times 5 \div 5$, the multiplication by 5 is offset by the division by 5, and we have 19 left.

A quick way of showing this in the form $\frac{19 \times 5}{5}$ is to strike out or cancel 5, the common factor of the numerator and the denominator.

$$\frac{19 \times \overset{1}{\cancel{5}}}{\underset{1}{\cancel{5}}} = \frac{19}{1} \text{ or } 19.$$

Divide 7×3 by 11×3 . $\frac{7 \times 3}{11 \times 3}$

3 is a common factor of both the dividend and the divisor, or of both the numerator and the denominator, and may be canceled:

$$\frac{7 \times \overset{1}{\cancel{3}}}{11 \times \underset{1}{\cancel{3}}} = \frac{7}{11}$$

Cancellation consists in removing equal factors from the dividend and the divisor.

EXAMPLE: $\frac{\overset{1}{\cancel{5}} \times \overset{1}{\cancel{7}} \times \overset{1}{\cancel{2}}}{\underset{2}{\cancel{10}} \times \underset{3}{\cancel{21}} \times \underset{2}{\cancel{4}}} = \frac{1}{2 \times 3 \times 2} = \frac{1}{12}$

19. Written Exercises.

Write the dividend above the line and the divisor below the line and cancel:

1. Divide 7×25 by 5.
2. Divide 28×16 by 7×8 .
3. Divide $21 \times 9 \times 4$ by $35 \times 18 \times 2 \times 5$.
4. Divide $8 \times 12 \times 14$ by $56 \times 36 \times 28$.

5. If 5 horses cost \$450, how much will 9 horses cost at the same rate?

$$1 \text{ horse will cost } \frac{\$450}{5}.$$

$$9 \text{ horses will cost } \frac{\$450}{5} \times 9 \text{ or } \frac{90 \times 450}{5} = \$810. \quad \text{Ans.}$$

6. How much will 8 sewing machines cost, if 3 cost \$195?

7. How much must I pay for 25 tons of coal if 6 tons cost \$42?

8. If 5 barrels of flour cost \$27.50, how much will 11 barrels cost?

9. How much must I pay for 42 sheep if 14 sheep cost \$98?

10. If 12 lb. of soap cost \$.96, how much must I pay for 23 lb.?

ADDITION AND SUBTRACTION OF FRACTIONS

20. Oral Exercises.

Express all fractions in answers in lowest terms. Change improper fractions in answers to mixed numbers.

Give answers at sight:

1.	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{3}{7}$
	$+\frac{1}{3}$	$+\frac{2}{5}$	$+\frac{2}{5}$	$+\frac{2}{5}$	$+\frac{2}{7}$	$+\frac{2}{7}$	$+\frac{2}{7}$
2.	$\frac{2}{3}$	$\frac{3}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{4}{5}$	$\frac{3}{7}$	$\frac{4}{7}$
	$-\frac{1}{3}$	$-\frac{1}{5}$	$-\frac{2}{5}$	$-\frac{2}{5}$	$-\frac{2}{5}$	$-\frac{1}{7}$	$-\frac{2}{7}$
3.	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{8}$	$\frac{5}{8}$	$\frac{3}{8}$	$\frac{1}{7}$	$\frac{3}{7}$
	$+\frac{1}{4}$	$+\frac{1}{6}$	$+\frac{3}{8}$	$+\frac{1}{8}$	$+\frac{3}{8}$	$+\frac{5}{7}$	$+\frac{4}{7}$
4.	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{3}{8}$	$\frac{5}{8}$	$\frac{8}{8}$	$\frac{7}{8}$	$\frac{7}{8}$
	$-\frac{1}{4}$	$-\frac{1}{6}$	$-\frac{1}{8}$	$-\frac{1}{8}$	$-\frac{5}{8}$	$-\frac{1}{8}$	$-\frac{3}{8}$

- | | | | | | | | |
|-----|---|---|---|---|---|--|--|
| 5. | $\frac{1}{2}$
<u>+ $\frac{1}{2}$</u> | $\frac{3}{4}$
<u>+ $\frac{1}{4}$</u> | $\frac{2}{3}$
<u>+ $\frac{1}{3}$</u> | $\frac{2}{3}$
<u>+ $\frac{2}{3}$</u> | $\frac{1}{5}$
<u>+ $\frac{4}{5}$</u> | $\frac{4}{5}$
<u>+ $\frac{2}{5}$</u> | $\frac{3}{5}$
<u>+ $\frac{3}{5}$</u> |
| 6. | 1
<u>- $\frac{1}{2}$</u> | 1
<u>- $\frac{3}{4}$</u> | 1
<u>- $\frac{2}{3}$</u> | $1\frac{1}{3}$
<u>- $\frac{2}{3}$</u> | 1
<u>- $\frac{4}{5}$</u> | | |
| 7. | $1\frac{1}{5}$
<u>- $\frac{2}{5}$</u> | $1\frac{2}{5}$
<u>- $\frac{3}{5}$</u> | $1\frac{2}{7}$
<u>- $\frac{5}{7}$</u> | $1\frac{2}{7}$
<u>- $\frac{6}{7}$</u> | $1\frac{1}{7}$
<u>- $\frac{3}{7}$</u> | | |
| 8. | $\frac{3}{4}$
<u>+ $\frac{3}{4}$</u> | $\frac{5}{6}$
<u>+ $\frac{5}{6}$</u> | $\frac{5}{8}$
<u>+ $\frac{5}{8}$</u> | $\frac{3}{8}$
<u>+ $\frac{7}{8}$</u> | $\frac{7}{8}$
<u>+ $\frac{7}{8}$</u> | | |
| 9. | $1\frac{1}{3}$
<u>+ $\frac{1}{3}$</u> | $1\frac{2}{5}$
<u>+ $\frac{1}{5}$</u> | $1\frac{1}{5}$
<u>+ $\frac{3}{5}$</u> | $1\frac{2}{5}$
<u>+ $\frac{2}{5}$</u> | $1\frac{1}{7}$
<u>+ $\frac{2}{7}$</u> | | |
| 10. | $2\frac{2}{7}$
<u>+ $\frac{2}{7}$</u> | $2\frac{2}{7}$
<u>+ $\frac{2}{7}$</u> | $3\frac{5}{7}$
<u>+ $\frac{1}{7}$</u> | $3\frac{4}{7}$
<u>+ $\frac{2}{7}$</u> | $2\frac{1}{7}$
<u>+ $\frac{4}{7}$</u> | | |
| 11. | $1\frac{1}{4}$
<u>- $\frac{3}{4}$</u> | $1\frac{2}{3}$
<u>- $\frac{1}{3}$</u> | $1\frac{2}{5}$
<u>- $\frac{1}{5}$</u> | $2\frac{3}{5}$
<u>- $\frac{2}{5}$</u> | $2\frac{4}{5}$
<u>- $\frac{3}{5}$</u> | | |
| 12. | $2\frac{4}{5}$
<u>- $\frac{2}{5}$</u> | $1\frac{3}{7}$
<u>- $\frac{1}{7}$</u> | $1\frac{4}{7}$
<u>- $\frac{2}{7}$</u> | $2\frac{5}{7}$
<u>- $\frac{3}{7}$</u> | $2\frac{6}{7}$
<u>- $\frac{1}{7}$</u> | | |
| 13. | $3\frac{1}{4}$
<u>+ $\frac{1}{4}$</u> | $2\frac{1}{6}$
<u>+ $\frac{1}{6}$</u> | $2\frac{1}{8}$
<u>+ $\frac{3}{8}$</u> | $1\frac{5}{8}$
<u>+ $\frac{1}{8}$</u> | $1\frac{3}{8}$
<u>+ $\frac{3}{8}$</u> | | |

21. Written Exercises.

Fractions that have the same denominator are said to have a common denominator.

Fractions must have a common denominator before they can be added.

Add, writing answers only :

- | | | | | |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 1. $3\frac{1}{5}$ | 2. $6\frac{1}{8}$ | 3. $7\frac{3}{8}$ | 4. $2\frac{2}{7}$ | 5. $8\frac{5}{9}$ |
| $2\frac{2}{5}$ | $4\frac{5}{8}$ | $5\frac{1}{8}$ | $6\frac{4}{7}$ | $2\frac{2}{9}$ |
| $1\frac{4}{5}$ | $1\frac{1}{8}$ | $4\frac{7}{8}$ | $1\frac{5}{7}$ | $1\frac{4}{9}$ |
| <u>$5\frac{1}{5}$</u> | <u>$5\frac{5}{8}$</u> | <u>$2\frac{1}{8}$</u> | <u>$2\frac{1}{7}$</u> | <u>$6\frac{1}{9}$</u> |

In the following examples, find the common denominator without using pencil and paper, and add the fractions, writing answers only.

- | | | | | |
|----------------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|
| 6. $4\frac{1}{3}$ | 7. $2\frac{2}{5}$ | 8. $4\frac{1}{4}$ | 9. $3\frac{2}{7}$ | 10. $5\frac{1}{3}$ |
| $5\frac{1}{3}$ | $3\frac{1}{5}$ | $6\frac{1}{4}$ | $4\frac{1}{7}$ | $2\frac{1}{3}$ |
| <u>$3\frac{1}{6}$</u> | <u>$5\frac{1}{10}$</u> | <u>$2\frac{1}{8}$</u> | <u>$5\frac{1}{14}$</u> | <u>$2\frac{1}{3}$</u> |

LEAST COMMON MULTIPLE AND LEAST COMMON DENOMINATOR

22. Written Exercises.

3	4	6
3	4	6
6	8	12
9	12	18
12	16	24
15	20	30
18	24	36
21	28	
24	32	
27	36	
30	40	
33		
36		
39		

In the column under 3 appear the multiples of 3 as far as 39.

Under 4 appear the multiples of 4 as far as 40.

Under 6 appear the multiples of 6 as far as 36.

The numbers in heavy black type (12, 24, and 36) are multiples of 3, 4, and 6. They are **common multiples** of 3, 4, and 6. Each of them is an exact dividend of 3, 4, and 6.

Of these three numbers (12, 24, 36) 12 is the **least common multiple** of 3, 4, and 6, because it is the smallest number that is an exact dividend of 3, 4, and 6.

1. This is a quick way of finding the least common multiple (l. c. m.) of 3, 4, and 6:

$\begin{array}{r} 3) \cancel{3}, 4, 6 \\ 2) \cancel{1}, \cancel{4}, \cancel{2} \\ 1, 2, 1 \end{array}$	Divide by any factor that is found in at least 2 of the numbers. 3 is found in 3 and 6. 4, which is not divisible by 3, is brought down. 2 is found in 4 and 2. Multiply $2 \times 2 \times 3$. The least common multiple is 12.
--	---

2. Find the l. c. m. of 3, 6, 12, and 21.

$\begin{array}{r} 3) \cancel{3}, \cancel{6}, 12, 21 \\ 4, 7 \end{array}$	3 and 6 are factors of 12, and any number that is divisible by 12 is also divisible by 3 and 6. So 3 and 6 can be crossed out. 3 is a factor of 12 and 21. The l. c. m. is $7 \times 4 \times 3$, or 84.
--	--

3. Find the l. c. m. of 3, 9, 10, 15, and 18.

$\begin{array}{r} 3) \cancel{3}, \cancel{9}, 10, 15, 18 \\ 2) 10, \cancel{5}, 6 \\ 5, 3 \end{array}$	3 and 9 are factors of 18 and can be crossed out. 3 is a factor of 15, 18. 10, which is not divisible by 3, is brought down. 5 is a factor of 10 and can be crossed out. 2 is a factor of 10 and 6. The l. c. m. is $3 \times 5 \times 2 \times 3$, or 90.
--	--

The least common multiple (l. c. m.) of the denominators of the following fractions is the same as the least common denominator (l. c. d.) of these fractions.

4. Add:

$5\frac{1}{3}$	84
$6\frac{5}{6}$	28
$8\frac{1}{2}$	70
$3\frac{2}{3}$	7
$23\frac{2}{4}$	8
<i>Ans.</i> $23\frac{2}{4}$	$113 = 1\frac{2}{4}$

$$\begin{array}{r} 3) \cancel{3}, \cancel{6}, 12, 21 \\ 4, 7 \end{array}$$

$7 \times 4 \times 3 = 84$, the least common denominator (l. c. d.) of the fractions.

Add the following mixed numbers:

$$\begin{array}{r} 5. \quad 9\frac{2}{3} \\ 5\frac{5}{6} \\ 12\frac{3}{10} \\ 11\frac{4}{15} \\ 10\frac{1}{18} \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 12\frac{1}{2} \\ 14\frac{3}{4} \\ 5\frac{7}{8} \\ 11\frac{1}{9} \\ 9\frac{2}{21} \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 22\frac{1}{2} \\ 30\frac{3}{4} \\ 5\frac{1}{8} \\ 16\frac{7}{8} \\ 20\frac{11}{24} \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 15\frac{2}{3} \\ 7\frac{1}{6} \\ 11\frac{5}{12} \\ 21\frac{7}{15} \\ 8\frac{3}{20} \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 5\frac{1}{2} \\ 7\frac{3}{4} \\ 12\frac{5}{8} \\ 14\frac{3}{16} \\ 8\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 21\frac{1}{3} \\ 16\frac{2}{7} \\ 12\frac{3}{10} \\ 4\frac{1}{14} \\ 5\frac{3}{20} \\ \hline \end{array}$$

23. Written Exercises.

2, 3, 5, 7, and 11 have no factors. They cannot be divided exactly by another number. They are called **prime numbers**.

Name the prime numbers between 1 and 50.

In addition of fractions, when all the denominators are prime numbers, *multiply the denominators together to find the least common denominator*.

$$\begin{array}{r|l} 42 & \\ 5\frac{1}{2} & 21 \\ 3\frac{2}{3} & 28 \\ 4\frac{1}{7} & 6 \\ \hline \text{Ans. } 13\frac{18}{42} & \frac{55}{42} = 1\frac{13}{42} \end{array}$$

$2 \times 3 \times 7 = 42$, the least common denominator.

Find sums: 1. $\begin{array}{r} 8\frac{2}{5} \\ 5\frac{1}{3} \\ 2\frac{2}{7} \\ \hline \end{array}$

4. $\begin{array}{r} 6\frac{2}{5} \\ 3\frac{3}{9} \\ \hline \end{array}$

2. $\begin{array}{r} 12\frac{1}{3} \\ 9\frac{3}{11} \\ 2\frac{4}{11} \\ \hline \end{array}$

5. $\begin{array}{r} 4\frac{2}{3} \\ 3\frac{2}{6} \\ \hline \end{array}$

3. $\begin{array}{r} 10\frac{2}{3} \\ 5\frac{5}{17} \\ 7\frac{2}{3} \\ \hline \end{array}$

6. $\begin{array}{r} 6\frac{2}{3} \\ 8\frac{6}{3} \\ \hline \end{array}$

Denominators that have no common factor are *prime to one another*. We multiply such denominators together to find their least common denominator.

$$\begin{array}{r} \text{Find sums: } 7. \quad 27\frac{3}{8} \\ 41\frac{2}{3} \\ \underline{16\frac{1}{5}} \end{array}$$

$$\begin{array}{r} 8. \quad 8\frac{5}{12} \\ 18\frac{3}{11} \\ \underline{4} \end{array}$$

$$\begin{array}{r} 9. \quad 12\frac{6}{13} \\ 7\frac{3}{10} \\ \underline{5} \end{array}$$

24. Written Exercises.

1. A farmer owned $73\frac{1}{2}$ acres of land, of which $15\frac{3}{4}$ were woodland. How many acres of cleared land did he own?

$$\begin{array}{r} 73\frac{1}{2} \\ 15\frac{3}{4} \\ \hline \text{Ans. } 58\frac{1}{4} \text{ (acres)} \end{array}$$

Find remainders, writing answers only:

$$\begin{array}{r} 2. \quad 52\frac{5}{8} \\ - 26\frac{1}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 37\frac{7}{8} \\ - 18\frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 74\frac{5}{7} \\ - 16\frac{2}{7} \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 81\frac{8}{9} \\ - 23\frac{2}{9} \\ \hline \end{array}$$

6. A grocer put $78\frac{1}{4}$ lb. of tea into 2 chests. Into one he put $37\frac{1}{8}$ lb. How many pounds did he put into the other?

$$\begin{array}{r|l} 12 & \\ 78\frac{1}{4} & 3 \quad \text{The first multiple of 6 is 12.} \\ 37\frac{1}{8} & 2 \quad \text{12 is also a multiple of 4.} \\ \hline 41\frac{1}{12} & 12 \quad \text{Therefore 12 is l. c. d. of the two fractions.} \end{array}$$

Ans. $41\frac{1}{12}$ (lb.)

To find l. c. d. when the denominators contain a common factor, *try the multiples of the larger denominator until one is found which is an exact dividend of the smaller denominator.*

Find remainders:

$$\begin{array}{r} 7. \quad 45\frac{1}{3} \\ 16\frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 57\frac{3}{10} \\ 35\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 99\frac{5}{8} \\ 55\frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 38\frac{3}{10} \\ \quad 16\frac{1}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 11. \quad 87\frac{7}{12} \\ \quad 41\frac{5}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 12. \quad 72\frac{7}{10} \\ \quad 50\frac{2}{15} \\ \hline \end{array}$$

13. Guy Clark started on a bicycle trip of $29\frac{1}{8}$ miles. He burst a tire after traveling $18\frac{1}{2}$ miles and walked the remainder of the distance. How many miles did he walk?

$$\begin{array}{r} 29\frac{1}{8} \\ 18\frac{1}{2} \\ \hline 10\frac{11}{8} \\ \text{Ans. } 10\frac{11}{8} \text{ (mi.)} \end{array}$$

$\frac{1}{8}$, the fraction in the subtrahend, is greater than $\frac{1}{2}$, the fraction in the minuend.

Increase the fraction in the minuend by 1, or $\frac{8}{8}$, which makes it $\frac{9}{8}$. $\frac{1}{8}$ and $\frac{1}{8}$ make $\frac{2}{8}$. Write $\frac{1}{4}$.

Since we added 1 to the minuend, we must add 1 to the subtrahend.

Add this 1 to 18, the whole number of the subtrahend. 19 and how many make 29? Write 10.

$$\begin{array}{r} 14. \quad 35\frac{1}{8} \\ \quad - 20\frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 40\frac{3}{8} \\ \quad - 14\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 16. \quad 66\frac{3}{4} \\ \quad - 32\frac{1}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 17. \quad 54\frac{3}{8} \\ \quad - 42\frac{1}{2} \\ \hline \end{array}$$

BILLS

JOHN WILSON and CO.

GROCERS

199 West 125 St.

NEW YORK, Dec. 11, 1916.

Sold to MR. JAMES JORDAN

186 West 121 St.

Dec.	9	3 lb. Butter	\$.40	1	20		
		2 doz. Eggs	.48		96		
		3 cans Tomatoes	.12		36		
		Received payment				2	52
		Dec. 11, 1916					
		JOHN WILSON and Co.					

The form here given is called a bill. It is a written account of goods sold by John Wilson and Co. to James Jordan.

Read the bill and answer the following :

The name and address of the seller, or creditor ?

The place and date of the sale ?

The name and address of the buyer, or debtor ?

The quantities and prices of the goods sold ?

The total amount, or footing, of the bill ?

Mr. James Jordan has paid the bill and the seller acknowledges payment, or receipts the bill, by signing his name under the words "Received payment."

25. Written Exercises.

GEORGE SWIFT & CO.

BUTCHERS

1780 Amsterdam Av.

NEW YORK, Dec. 15, 1916.

Sold to MRS. KATE CLARKE

475 West 146 St.

Dec.	14	4 lb. Beefsteak	\$.28				
		2 lb. Lamb chops	.25				
		5 lb. Chicken	.26				
		1 Squab	.45				
		Received payment					
		Dec. 15, 1916					
		GEORGE SWIFT & Co.					
		per S. S.					

1. In the above bill make the extensions, that is, find and write the amount of the different items.

Find the total amount, or footing, of the bill.

Mrs. Clarke pays the bill to a clerk, Sam Swartz. He receipts the bill by writing under "Received payment" "George Swift & Co. per S. S."

Per means by. Why does the clerk write "per S. S."?

2. Mr. Frank Burns of 35 West 48 St. on Sept. 11, 1917, bought of John Wanamaker, Dry Goods, Broadway and 10 St., 3 shirts @ \$1.75, 2 doz. collars @ \$1.50, 3 pairs of socks @ \$.25, and 1 necktie @ \$.75. The bill was made out and sent to Mr. Burns on September 29. He paid the bill on October 1. A clerk, Kate Morgan, receipted it.

Draw the necessary lines, and using the bill on page 36 for a model, make out a bill for the goods Mr. Burns bought. Use no unnecessary words such as *at* or its abbreviation @. Abbreviate "3 pr. socks," etc.

3. Make out the following bill:

Mrs. Charles Reid of 17 West 76 St. on Oct. 9, 1917, bought of Acker, Merrall & Condit, Grocers, Amsterdam Avenue and 72 St., 5 lb. coffee @ \$.35, 20 lb. sugar @ \$.05½, 3 lb. tea @ \$.45, and 6 bars soap @ \$.15. The bill was sent to Mrs. Reid on October 15. A clerk, George Brown, receipts it on October 17.

It is always wise to keep receipted bills. Why?

APPROXIMATE ANSWERS

26. Exercises.

I. The first year that John Rudd worked, he saved \$197. The second year he saved \$295. How much did he save in these 2 years?

$$\begin{array}{r} \$197 \\ + 295 \\ \hline \end{array}$$

It is sometimes very useful, in everyday life, to tell at sight answers that are nearly exact.

Look at this example in addition and see how near you can come to finding the answer at sight.

Notice that the first number, 197, is a little less than 200 and that the second number, 295, is a little less than 300. It will be sufficient if you say, "The answer will be a little less than \$500."

After you have told your approximate answer, add with pencil and paper.

II. Miss Frank paid \$41 for a muff, \$33 for a dress, and \$49 for a coat. How much did she pay for all three?

$$\begin{array}{r} \$41 \\ 33 \\ \hline 49 \end{array}$$

41 is a little more than 40; 33 is a little more than 30; 49 is a little less than 50. Try to tell the answer at sight. Afterwards add with pencil and paper.

In the following examples in addition, give answers that are as nearly correct as possible. Then test your answers by adding with pencil and paper.

Add:

$$\begin{array}{r} 1. \quad 159 \\ 312 \\ \hline 238 \end{array}$$

$$\begin{array}{r} 2. \quad 110 \\ 491 \\ \hline 296 \end{array}$$

$$\begin{array}{r} 3. \quad 77 \\ 68 \\ \hline 22 \end{array}$$

$$\begin{array}{r} 4. \quad 195 \\ 288 \\ \hline 101 \end{array}$$

$$\begin{array}{r} 5. \quad 209 \\ 792 \\ \hline 810 \end{array}$$

$$\begin{array}{r} 6. \quad 586 \\ 679 \\ \hline 104 \end{array}$$

$$\begin{array}{r} 7. \quad 197 \\ 398 \\ \hline 205 \end{array}$$

$$\begin{array}{r} 8. \quad 98 \\ 29 \\ \hline 51 \end{array}$$

$$\begin{array}{r} 9. \quad 53 \\ 61 \\ 39 \\ \hline 72 \end{array}$$

$$\begin{array}{r} 10. \quad 61 \\ 59 \\ 41 \\ \hline 32 \end{array}$$

$$\begin{array}{r} 11. \quad 99 \\ 21 \\ 32 \\ \hline 50 \end{array}$$

$$\begin{array}{r} 12. \quad 204 \\ 492 \\ 520 \\ \hline 689 \end{array}$$

13. Robert Wright had \$915 and spent \$485. How much did he have left?

A glance at this problem will show us that the man had a little more than \$900 and that he spent almost \$500. It will be sufficient to say that a little more than \$400 was left.

Doing the subtraction with pencil and paper, we find the exact answer :

$$\begin{array}{r} \$915 \\ - 485 \\ \hline \$430 \end{array}$$

In the following examples in subtraction, give answers that are as nearly exact as possible. Then do the subtraction with pencil and paper.

14.
$$\begin{array}{r} 987 \\ - 498 \\ \hline \end{array}$$

16.
$$\begin{array}{r} 1,125 \\ - 99 \\ \hline \end{array}$$

18.
$$\begin{array}{r} 7,456 \\ - 2,511 \\ \hline \end{array}$$

20.
$$\begin{array}{r} 801 \\ - 596 \\ \hline \end{array}$$

15.
$$\begin{array}{r} 5,125 \\ - 2,898 \\ \hline \end{array}$$

17.
$$\begin{array}{r} 3,957 \\ - 899 \\ \hline \end{array}$$

19.
$$\begin{array}{r} 6,069 \\ - 4,945 \\ \hline \end{array}$$

21.
$$\begin{array}{r} 10,000 \\ - 9,898 \\ \hline \end{array}$$

Give answers that are as nearly exact as possible. Then do the multiplication with pencil and paper.

22. At the rate of $19\frac{1}{2}$ miles an hour, how far will a steamship go in 24 hours?

$19\frac{1}{2}$ is almost 20. $20 \times 24 = 480$. (Approximate answer.)

23. Find the cost of $48\frac{3}{4}$ lb. of butter at 40¢ per pound.

24. Find the cost of 97 horses at \$175 each.

25. How much will a dealer receive for 49 suits of clothes at \$12 per suit?

26. At a ball game 3,989 persons paid for 50-cent seats. How much was taken in at the box office for these seats?

27. Find the cost of 9 gal. 3 qt. 1 pt. of milk at 32¢ per gallon.

27. Oral Problems.

1. A car conductor collected \$15 in 5-cent fares during one day. How many fares did he collect?

2. How many nickels are there in \$2.55?

3. How many dimes in \$10?

4. Millie spent \$.69 for thread and needles. How much change should she receive from a five-dollar bill?

5. Sam has \$.38 in his bank. He is saving to buy a toy engine. How much more money must he save if the engine costs \$.65?

6. A pie was divided into 8 equal parts. $\frac{3}{4}$ of the pie was eaten. How many pieces were left?

7. Joseph earned 45 cents, and gave $\frac{1}{3}$ of it to his brother. How much did he have left?

8. A train was due in New York at 9:35 A.M. It did not arrive until 11:05 A.M. How late was the train?

9. A trolley car can carry 50 children. How many cars will be needed to carry 450 pupils to Central Park?

10. How many quarters are there in \$7.75?

11. How many dollars in 15 dimes and 11 nickels?

12. Susie's dress cost \$19. Her mother's dress cost twice as much and \$15 more. How much did her mother's dress cost?

13. Sally used 2 eggs in making a cake, 6 eggs in making a custard, and 3 eggs in making a pudding. There are 13 eggs left. How many eggs did she have at first?

14. How many 2-cent stamps can I buy for \$3.50?

15. At the rate of a dime a day, how much money can a boy earn in 3 months, counting 26 working days to a month?

THE JEWELER

16. A jeweler bought a bracelet for \$45 and sold it at a gain of \$18. For how much did he sell the bracelet?

17. He sold a ring for \$81 and gained \$14. What was the cost of the ring?

18. He bought a pin for \$91 and sold it for \$76. How much did he lose?

19. He bought a chain for \$58 and sold it for \$72. How much did he gain?

20. He bought a ring for \$63 and sold it at a loss of \$17. Find the selling price.

21. He sold a watch for \$91 and lost \$12 by the sale. What was the cost of the watch?

28. Oral Problems.

1. A watch was sold for $\$10\frac{1}{2}$, which was $\$3\frac{3}{4}$ less than it cost. What did it cost?

2. A man takes a railroad trip of 50 miles. If the fare is at the rate of $2\frac{1}{2}$ cents a mile, what does his ticket cost him? How much change will he get from a \$2 bill?

3. A half yard of ribbon sells for \$.20. At this rate, what will $1\frac{1}{4}$ yd. cost?

4. How many \$1 bills should I get for 80 quarter dollars? How many \$2 bills? How many \$5 bills? How many \$10 bills? How many \$20 bills?

5. In order to reach school, Frank rowed $\frac{3}{8}$ of a mile and walked $\frac{3}{4}$ of a mile. How far was his home from the school?

Give answers at sight:

6. Ellen had $3\frac{5}{8}$ yd. of ribbon. She cut off $1\frac{1}{4}$ yd. for a hair ribbon. How many yards did she have left?

7. John is practicing for a running race. On Monday he ran $2\frac{5}{8}$ miles. On Tuesday he ran $\frac{1}{4}$ of a mile less. How far did he run on Tuesday?

8. Ellen bought 3 remnants of lace. The first was $\frac{5}{12}$ yd. long, the second $\frac{1}{8}$ yd. long, and the third $\frac{3}{8}$ yd. long. How many yards did she buy?

9. Samuel studied $\frac{3}{4}$ of an hour before dinner and $\frac{2}{5}$ of an hour after dinner. How many hours did he study?

10. A man paid $\frac{2}{3}$ of his debt at one time and $\frac{1}{6}$ of it at another. What part remained unpaid?

11. Last week Clare bought $9\frac{7}{8}$ yd. of muslin. She has used all but $1\frac{1}{4}$ yd. of it. How many yards has she used?

12. What is the area of a ceiling 15 ft. long and 10 ft. wide?

13. What will be the cost of tinting this ceiling at $1\frac{1}{3}$ cents a square foot?

14. There are two coal bins in the cellar of an apartment house. The first bin contains $12\frac{3}{4}$ tons of coal, the second $18\frac{3}{4}$ tons. How many tons are there in both bins?

15. How much of this coal is left after 21 tons have been consumed?

THE NEWSBOY

16. A boy paid 20 cents for newspapers at the rate of 5 for 2 cents. How many papers did he buy?

17. He sold $\frac{4}{5}$ of his newspapers at 1 cent each. What did he get for them? What was his profit?

18. At the rate of 5 papers for 2 cents, what must he pay for 40 papers?

19. If he sells these 40 papers for 1 cent each, what will his profit be?

29. Written Problems.

1. A tailor has an order for 5 suits of clothes. How many yards of cloth will he need, if the first suit requires $4\frac{1}{2}$ yd., the second suit $3\frac{5}{8}$ yd., the third suit $5\frac{1}{3}$ yd., the fourth suit $4\frac{1}{2}$ yd., and the fifth suit $5\frac{3}{4}$ yd.?

2. A milliner used $2\frac{7}{8}$ yd. of ribbon for one hat, $3\frac{5}{8}$ yd. for a second hat, and $1\frac{3}{4}$ yd. for a third hat. How many yards of ribbon did she use for the three hats?

3. Mr. Jones weighs $178\frac{1}{8}$ lb. He has gained $12\frac{1}{4}$ lb. in 6 months. How much did he weigh 6 months ago?

4. Nellie embroidered a bureau scarf $3\frac{7}{8}$ ft. in length, and Mary embroidered one $3\frac{5}{8}$ ft. in length. How much longer than Mary's scarf was Nellie's?

5. Amy Black used $8\frac{1}{3}$ yd. of broadcloth for dresses for herself and her sister. She used $4\frac{7}{8}$ yd. for her own dress. How much did she use for her sister's dress?

6. In 2 weeks a cook used her stock of $82\frac{5}{8}$ lb. of flour. The first week she used $49\frac{3}{4}$ lb. How much did she use the second week?

7. An express train goes at the rate of $51\frac{5}{8}$ miles an hour. A local train goes at the rate of $24\frac{2}{3}$ miles an hour. In 2 hours, how much farther will the express train go than the local?

8. On Monday a grocer had $946\frac{5}{11}$ lb. of sugar on hand. On Saturday he had only $187\frac{2}{3}$ lb. How much sugar did he sell during the week?

9. John weighs $83\frac{3}{4}$ lb. How much heavier is he than his baby brother, who weighs $14\frac{7}{8}$ lb.?

10. A traveling salesman made a trip of 345 miles in 4 days. The first day he traveled $84\frac{5}{8}$ mi.; the second day, $72\frac{7}{8}$ mi.; the third day, $63\frac{1}{3}$ mi. How many miles did he travel the fourth day?

11. Kate Simpson made a linen apron for her mother and three aprons for her sisters. She used $1\frac{1}{8}$ yd., $\frac{1}{2}$ yd., $\frac{7}{8}$ yd., and $\frac{3}{4}$ yd. of linen. How many yards of linen did she use for the four aprons?

12. I bought an automobile for \$1,250. I kept it for six months at an expense of \$30 per month and then sold it for \$975. How much did I pay for the use of the automobile for these 6 months?

13. Mr. Clark bought \$675 worth of furniture and paid for it by giving 2 one-hundred-dollar bills, 8 fifty-dollar bills, 1 five-dollar bill, and the remainder in ten-dollar bills. How many ten-dollar bills did he give?

14. A man bought a city lot for \$4,500. He built on it a house which cost \$4,375 more than the lot. He sold house and lot for \$12,275. Did he gain or lose and how much?

15. Fred Johnson had \$10. He bought a hat for \$2.50, a shirt for \$1.25, a pair of shoes for \$3.50, a pair of suspenders for \$.50, and 4 neckties at \$.25 each. With the remainder he bought collars at 2 for \$.25. How many collars did he buy?

16. The divisor is 205, the quotient is 216, and the remainder is 17. What is the dividend?

17. A tailor cut $4\frac{1}{4}$ yards, $3\frac{1}{2}$ yards, and $7\frac{3}{8}$ yards from a piece of cloth containing $25\frac{3}{4}$ yards. How many yards remained?

18. $\frac{2}{3}$ of a pole is in the mud, $\frac{4}{7}$ of it is in the water, and the rest of it is in the air. How much of it is in the air?

19. A farmer owned 300 acres of land. He sold at one time $48\frac{3}{4}$ acres and at another time $72\frac{5}{8}$ acres. How many acres does he still own?

20. A train for Albany left the Grand Central Station in New York with 450 passengers. It made four stops on the trip. At the first stop 68 passengers got off and 19 got on. At the second

stop 27 passengers got off and 15 got on. At the third stop 40 passengers got off and 25 got on. At the fourth stop 32 passengers got off and 19 got on. How many passengers were on the train when it reached Albany?

30. Written Problems.

THE PEDDLER

1. A peddler had 720 apples on his pushcart. He sold $\frac{1}{3}$ of these for 2¢ each, $\frac{2}{3}$ for 3¢ each, and the remainder for 4¢ each. How much did he receive for his apples?

2. The money taken in showed a profit of \$3.20. How much did the peddler pay for the apples?

3. If the peddler gained \$3.20 a load and sold a load every 2 days, how much would he gain in 5 weeks, working 6 days a week?

THE COOKING CLASS

A cooking class pays these prices:

Flour	4 cents a pound
Butter	40 cents a pound
Eggs	4 cents each
Chocolate	40 cents a pound
Nutmeg	1 cent each
Sugar	6 cents a pound
Milk	8 cents a quart
Rice	8 cents a pound

4. What will it cost the class to make a chocolate cake according to this recipe?

1 cup of sugar	(2 cups to a pound)
3 cups of flour	(4 cups to a pound)
$1\frac{1}{2}$ cups of butter	(2 cups to a pound)
2 cups of milk	(2 cups to one pint)
2 eggs and $\frac{1}{4}$ lb. chocolate	

5. How much will it cost the class to make breakfast puffs, using 1 pint of milk, $\frac{1}{4}$ lb. of butter, 5 eggs, and $\frac{3}{4}$ lb. of flour?

6. How much will it cost to make 4 pound cakes if each cake requires 1 lb. of flour, 1 lb. of butter, 1 lb. of sugar, 10 eggs, and $\frac{1}{4}$ of a nutmeg?

7. The class made rice croquettes. How much did they cost if the recipe called for 6 oz. of rice, 1 pt. of milk, 2 oz. of butter, and 2 oz. of sugar?

THE LITTLE HELPERS

A girls' club, called "The Little Helpers," gave an entertainment and sold refreshments for charity.

8. Admission to the entertainment was 15 cents. They sold 45 tickets the first night and 50 tickets the second night. How much money did they take in both nights?

9. One girl brought 5 lb. of candy done up in $\frac{1}{4}$ -pound packages. She sold these at 25¢ a package. How much did she receive for her candy?

10. Another girl brought peanuts. She sold them at the rate of 2 little bags of peanuts for 5¢. She took in \$1.00. How many packages did she sell?

11. A third girl brought a gallon of lemonade. She sold this at 5¢ a glass. At the rate of a half pint to a glass, how much money did she receive for the lemonade?

12. A fourth girl made two cakes for the party. One cake was cut into 12 pieces and the other into 10 pieces. At the rate of 5 cents a slice, how much did she make if she sold $\frac{1}{12}$ of the first cake and $\frac{2}{10}$ of the second cake?

13. The parents of the girls added enough to make their profits \$66. Of this $\frac{1}{2}$ was given to a lame boy, $\frac{1}{3}$ to a woman for food, $\frac{1}{11}$ to a sick man for coal; and the remainder was spent for shoes. At \$2.50 per pair, how many pairs of shoes were bought?

SECOND QUARTER

COUNTING

31. Oral Exercises.

1. Beginning with 5, count by 7's to 103.
2. Beginning with 6, count by 8's to 102.
3. Beginning with 7, count by 6's to 103.
4. Beginning with 9, count by 8's to 105.

ADDITION

32. Oral Exercises.

$77 + 55$	$84 + 37$	$55 + 56$	$53 + 78$
$44 + 68$	$31 + 69$	$28 + 73$	$39 + 72$
$95 + 26$	$58 + 43$	$64 + 49$	$33 + 91$

33. Written Exercises.

1. 11,678,916	2. \$139.63	3. 7,336,742
4,335,206	926.75	4,724,338
3,705,194	67.85	2,126,577
8,891,017	143.22	1,305,703
5,506,342	854.67	3,672,128
2,095,001	563.73	5,428,916
8,242,735	92.55	2,181,104
<u>2,606,901</u>	<u>128.52</u>	<u>1,223,312</u>

Add :

4. Ninety-four dollars and thirty-eight cents,
 Sixty-eight dollars and seventy-four cents,
 Two hundred thirty-nine dollars and sixty-three cents,
 One hundred eighty-three dollars and sixty-six cents,
 Six hundred fifty-two dollars and seventy-four cents,
 Nine hundred sixty-eight dollars and thirty-five cents,
 One hundred forty dollars and fifteen cents,
 Sixty-eight dollars and ninety-four cents,
 One thousand twenty-five dollars and sixteen cents,
 Two hundred forty-eight dollars and fifty-two cents.

5. Ninety-eight million three hundred forty-two thousand five hundred twenty-three,

Twelve million six hundred sixty-eight thousand five hundred seven,

Twenty-one million two hundred seventeen thousand three hundred forty-two,

Fourteen million three hundred three thousand seven hundred sixty-one,

Twenty-eight million five hundred thirty-four thousand two hundred nine.

6.	372,916	7. \$	672.26	8.	5,363,472
	438,194		156.14		5,741,618
	567,772		1,052.25		4,909,507
	513,626		438.82		8,111,233
	56,107		75.75		5,072,817
	834,923		15.34		4,338,191
	122,334		94.33		6,006,721
	735,124		23.77		9,124,319
	375,982		1.25		1,232,224
	<u> </u>		<u> </u>		<u> </u>

9. In Spain, 59,305,054 acres are used for pasturage; 39,536,703 acres for grain and vegetables; 8,648,654 acres for olives and grapes; 6,177,610 acres for other products. Find the total number of acres used for these purposes.

10. Find the total population of the United States:

	MALE	FEMALE
White	42,178,245	39,553,712
Negro	4,885,881	4,941,882
Indian	135,133	130,550
Chinese	66,856	4,675
Japanese	63,070	9,087
All other	<u>3,092</u>	<u>83</u>

11. Find the area of the Great Lakes:

Superior	31,000 sq. mi.
Huron	24,000 sq. mi.
Erie	10,500 sq. mi.
Ontario	7,250 sq. mi.
Michigan	<u>22,500 sq. mi.</u>

12. Find the total number of persons who speak these seven languages:

LANGUAGES	NUMBER OF PERSONS
English	160,000,000
French	70,000,000
German	130,000,000
Italian	50,000,000
Spanish	50,000,000
Portuguese	25,000,000
Russian	100,000,000

13. Add :

Three million seven hundred seventy-four thousand one hundred sixteen,

Seven million two hundred thirty-six thousand two hundred fourteen,

Five million eight hundred twenty-four thousand six hundred seventy-one,

One million nine hundred eighty thousand four hundred fifteen,

Four million two hundred twenty-five thousand five,

Six million three hundred eighty-five thousand eight hundred twenty-four,

Two million three hundred sixteen thousand one hundred thirty-nine,

One million one hundred ninety-four thousand two hundred seventy-one.

14. One hundred twelve,
Nine hundred twenty-two,
Eight hundred sixty-seven,
Five hundred ninety-three,
Seven hundred eighty-five,
Four hundred four,

Six hundred sixteen,
Three hundred seventy-three,
Two hundred fifty-four,
Nine hundred fifty-six,
One hundred ninety-five,
Eight hundred fifteen.

15. 63,003	16. 892	17. \$629.75
89,827	68,417	991.15
46,307	78,913	836.21
6,283	60,085	658.39
80,106	675 $\frac{1}{2}$	959.53
7,431	244,971	468.17
84,000	86,016	407.70
53,624	53,764 $\frac{1}{2}$	203.36
5,802	2,452 $\frac{1}{2}$	68.54
<u>35,218</u>	<u>6,870</u>	<u>12.22</u>

18. 663,225	19. 2,783,416	20. \$1,562.35
347,325	5,379,804	9,815.64
935,782	6,744,353	656.76
890,526	2,836,078	8,132.11
336,007	3,674,402	5,743.56
494,933	9,373,444	452.65
427,248	1,717,626	881.45
<u>283,862</u>	<u>2,691,282</u>	<u>1,217.41</u>

SUBTRACTION

34. Oral Exercises.

From 81 subtract 39.

From 81 subtract the tens' figure of the subtrahend: $81 - 30 = 51$. Then subtract the units' figure of the subtrahend. $51 - 9 = 42$. Think 81, 51, 42.

81	99	54	62	41	73
68	72	43	55	61	96
71	85	97	64	56	93
63	76	51	84	67	95
94	75	66	52	44	83
82	74	65	53	45	98

1. From each of the above numbers, subtract each of the following: 39, 28, 37, 26, 35.

Give answers:

- | | | |
|-------------------|-------------------|--------------------|
| 2. $50 + 60 - 40$ | 6. $50 + 70 - 30$ | 10. $30 + 80 - 60$ |
| 3. $30 + 70 - 20$ | 7. $50 + 50 - 80$ | 11. $60 + 60 - 90$ |
| 4. $90 + 50 - 70$ | 8. $70 + 40 - 60$ | 12. $90 + 30 - 70$ |
| 5. $50 + 80 - 40$ | 9. $40 + 90 - 50$ | 13. $80 + 40 - 30$ |

35. Written Exercises.

1.	45,963,469	2.	\$1,257,679.34	3.	234,955,617
	<u> 572 </u>		<u> 1,164,739.15 </u>		<u> 71,725 </u>

4. From nine hundred eighty-six thousand three hundred fifty-two dollars and forty-five cents subtract one hundred ninety-four thousand five hundred thirteen dollars and twenty-six cents.

5. If the minuend is three hundred seventy-six thousand five hundred fifty-four dollars and eighty-five cents, and the subtrahend is sixty-three dollars and ninety-four cents, what is the remainder?

6. A dealer sold an automobile for \$1,685 and thereby gained \$276.50. What did the dealer pay for the automobile?

7. A sailing vessel that cost its owners \$45,308.50 was lost at sea. They received \$26,229 insurance. How much did they lose on the vessel?

8. A real estate agent bought a house for \$18,756.50. He sold it for \$21,100. Did he gain or lose and how much?

9. The population of Connecticut is 1,114,756. The population of Rhode Island is 542,610. How much greater than the population of Rhode Island is the population of Connecticut?

Name and supply the missing terms :

10.	2,973,543	11.	?	12.	65,782,605
	<u> ? </u>		<u> 6,638,563 </u>		<u> 46,123,214 </u>
	1,281,930		2,721,674		?

Find the missing numbers :

13.	83,416	14.	?	15.	44,353
	<u> ? </u>		<u> 79,804 </u>		<u> ? </u>
	216,507		209,943		92,461

MULTIPLICATION**36. Oral Exercises.**

1. Multiply each number from 1 to 16 by 6.
2. Multiply each number from 1 to 14 by 7.
3. Multiply each of the following numbers by 9: 22, 33, 44, 55, 61, 73, 82, 91, 100, 110, 120.

37. Written Exercises.

How many of the following examples in multiplication can you work correctly in 10 minutes?

1. $2,634,563 \times 11$

3. $9,867,379 \times 7$

2. $\$45,423.15 \times 12$

4. $\$246,798.33 \times 8$

5.
$$\begin{array}{r} 463,000 \\ \times 506 \\ \hline \end{array}$$

9.
$$\begin{array}{r} 8,645 \\ \times 7,570 \\ \hline \end{array}$$

13.
$$\begin{array}{r} \$687.34 \\ \times 5003 \\ \hline \end{array}$$

17.
$$\begin{array}{r} 6,135 \\ \times 5,478 \\ \hline \end{array}$$

6.
$$\begin{array}{r} \$6,159.27 \\ \times 402 \\ \hline \end{array}$$

10.
$$\begin{array}{r} \$403.06 \\ \times 6850 \\ \hline \end{array}$$

14.
$$\begin{array}{r} 8,316 \\ \times 4,009 \\ \hline \end{array}$$

18.
$$\begin{array}{r} \$58.42 \\ \times 4329 \\ \hline \end{array}$$

7.
$$\begin{array}{r} 65,962 \\ \times 850 \\ \hline \end{array}$$

11.
$$\begin{array}{r} 7,642 \\ \times 7,040 \\ \hline \end{array}$$

15.
$$\begin{array}{r} 54,062 \\ \times 876 \\ \hline \end{array}$$

19.
$$\begin{array}{r} 7,988 \\ \times 5,006 \\ \hline \end{array}$$

8.
$$\begin{array}{r} \$582.17 \\ \times 690 \\ \hline \end{array}$$

12.
$$\begin{array}{r} \$807.65 \\ \times 5030 \\ \hline \end{array}$$

16.
$$\begin{array}{r} \$7,695.84 \\ \times 90 \\ \hline \end{array}$$

20.
$$\begin{array}{r} \$37.54 \\ \times 879 \\ \hline \end{array}$$

DIVISION**38. Oral Exercises.**

1. Divide each of the following numbers by 6: 84, 96, 108, 120, 132, 126, 114, 102, 90.
2. Divide by 7: 98, 112, 126, 140, 154, 147, 133, 119, 105.
3. Divide by 8: 104, 120, 136, 152, 168, 160, 144, 128, 112.
4. Divide by 9: 126, 144, 162, 180, 198, 171, 153, 135, 189.

39. Written Exercises.

- | | |
|----------------------------|------------------------------|
| 1. \$14,345.64 $\div$ 6 | 11. \$193,875.33 $\div$ 357 |
| 2. 7,854,946 $\div$ 8 | 12. 93,784,394 $\div$ 86 |
| 3. \$75,728.94 $\div$ 7 | 13. \$946,872.65 $\div$ 537 |
| 4. 44,786,958 $\div$ 9 | 14. 198,673,984 $\div$ 68 |
| 5. \$27,576.57 $\div$ 7 | 15. 347,873,574 $\div$ 96 |
| 6. 873,620 $\div$ 8 | 16. 343,765,984 $\div$ 784 |
| 7. \$783,459.36 $\div$ 514 | 17. 4,704,075 $\div$ 345 |
| 8. 78,998,398 $\div$ 42 | 18. 9,304,794 $\div$ 81 |
| 9. \$947,659.50 $\div$ 225 | 19. 4,092,894 $\div$ 658 |
| 10. 89,783,469 $\div$ 54 | 20. 423,568,872 $\div$ 3,672 |

REDUCTION OF FRACTIONS**40. Oral Exercises.**

1. Reduce at sight to lowest terms:

$\frac{14}{20}$	$\frac{6}{24}$	$\frac{4}{24}$	$\frac{2}{28}$	$\frac{13}{28}$	$\frac{4}{28}$
$\frac{10}{30}$	$\frac{18}{32}$	$\frac{2}{34}$	$\frac{32}{36}$	$\frac{16}{36}$	$\frac{24}{36}$
$\frac{24}{40}$	$\frac{8}{42}$	$\frac{88}{44}$	$\frac{32}{48}$	$\frac{8}{52}$	$\frac{48}{56}$

2. Change to twelfths:
- $\frac{1}{3}$
- ,
- $\frac{1}{4}$
- ,
- $\frac{1}{6}$
- ,
- $\frac{2}{3}$
- ,
- $\frac{3}{4}$
- ,
- $\frac{5}{6}$
- .

3. Change to twenty-fourths:
- $\frac{1}{2}$
- ,
- $\frac{1}{3}$
- ,
- $\frac{1}{4}$
- ,
- $\frac{1}{6}$
- ,
- $\frac{1}{8}$
- ,
- $\frac{1}{12}$
- ,
- $\frac{2}{3}$
- ,
- $\frac{3}{4}$
- ,
- $\frac{5}{6}$
- ,
- $\frac{3}{8}$
- ,
- $\frac{5}{8}$
- ,
- $\frac{7}{8}$
- .

4. Change to twenty-eighths:
- $\frac{1}{2}$
- ,
- $\frac{1}{4}$
- ,
- $\frac{1}{7}$
- ,
- $\frac{3}{4}$
- ,
- $\frac{2}{7}$
- ,
- $\frac{5}{7}$
- ,
- $\frac{1}{14}$
- ,
- $\frac{9}{14}$
- ,
- $\frac{11}{14}$
- ,
- $\frac{13}{14}$
- ,
- $\frac{7}{7}$
- ,
- $\frac{14}{14}$
- .

5. Change to thirty-seconds:
- $\frac{1}{4}$
- ,
- $\frac{3}{4}$
- ,
- $\frac{1}{8}$
- ,
- $\frac{3}{8}$
- ,
- $\frac{5}{8}$
- ,
- $\frac{7}{8}$
- ,
- $\frac{8}{8}$
- ,
- $\frac{1}{16}$
- ,
- $\frac{5}{16}$
- ,
- $\frac{15}{16}$
- ,
- $\frac{4}{4}$
- ,
- $\frac{16}{16}$
- .

41. Written Exercises.

In reducing fractions to lowest terms, remember that

When the sum of the digits (figures) of a number is divisible by 3, the number itself is divisible by 3.

Reduce to lowest terms:

- | | | | | | |
|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| 1. $\frac{54}{72}$ | 4. $\frac{33}{51}$ | 7. $\frac{45}{69}$ | 10. $\frac{36}{87}$ | 13. $\frac{27}{93}$ | 16. $\frac{24}{111}$ |
| 2. $\frac{39}{123}$ | 5. $\frac{63}{129}$ | 8. $\frac{72}{141}$ | 11. $\frac{18}{159}$ | 14. $\frac{81}{177}$ | 17. $\frac{90}{183}$ |
| 3. $\frac{72}{201}$ | 6. $\frac{51}{213}$ | 9. $\frac{69}{219}$ | 12. $\frac{87}{237}$ | 15. $\frac{78}{216}$ | 18. $\frac{96}{246}$ |

CANCELLATION**42. Written Exercises.**

Write the dividend above the line and the divisor below the line and cancel. Divide:

- 64×18 by 96×11
- 36×45 by 10×3
- 40×43 by 4×5
- $20 \times 42 \times 21$ by $20 \times 21 \times 18$
- If a clothier receives \$600 for 30 overcoats, how much will he receive for 63 overcoats at the same rate?
- If 15 acres of land cost \$4,800, how much must I pay for 45 acres at the same rate?
- Find the cost of 37 yd. of ribbon, when 30 yd. cost \$3.00.
- Find the cost of 46 doz. eggs, when 23 doz. cost \$9.20.
- The product of three numbers is 504. Two of the numbers are 8 and 9. Find the third number.

ADDITION AND SUBTRACTION OF FRACTIONS**43. Oral Exercises.**

Give answers at sight:

- | | | | | |
|-------------------|----------------|----------------|----------------|----------------|
| 1. $\frac{23}{4}$ | $\frac{15}{8}$ | $\frac{15}{8}$ | $\frac{13}{8}$ | $\frac{17}{8}$ |
| $+\frac{3}{4}$ | $+\frac{5}{8}$ | $+\frac{5}{8}$ | $+\frac{7}{8}$ | $+\frac{7}{8}$ |

2.	$2\frac{1}{4}$	$1\frac{1}{8}$	$1\frac{3}{8}$	$1\frac{1}{8}$	$1\frac{5}{8}$
	$-\frac{3}{4}$	$-\frac{5}{8}$	$-\frac{5}{8}$	$-\frac{3}{8}$	$-\frac{7}{8}$

3. Add $2\frac{1}{3} + 2\frac{1}{3}$.

Add to the first addend the integer of the second addend, $2\frac{1}{3} + 2 = 4\frac{1}{3}$.

Then add the fraction of the second addend, $4\frac{1}{3} + \frac{1}{3} = 4\frac{2}{3}$. Think $2\frac{1}{3}$, $4\frac{1}{3}$, $4\frac{2}{3}$.

4.	$2\frac{1}{5}$	$2\frac{1}{5}$	$1\frac{2}{5}$	$2\frac{1}{7}$	$3\frac{2}{7}$
	$+1\frac{2}{5}$	$+1\frac{2}{5}$	$+1\frac{2}{5}$	$+3\frac{2}{7}$	$+1\frac{2}{7}$

5.	$2\frac{2}{3}$	$3\frac{2}{3}$	$3\frac{4}{5}$	$2\frac{4}{5}$	$5\frac{2}{5}$
	$-1\frac{1}{3}$	$-1\frac{2}{3}$	$-2\frac{1}{5}$	$-1\frac{2}{5}$	$-2\frac{1}{5}$

6.	$2\frac{1}{4}$	$2\frac{1}{8}$	$2\frac{1}{8}$	$1\frac{5}{8}$	$1\frac{3}{8}$
	$+2\frac{1}{4}$	$+2\frac{1}{8}$	$+1\frac{3}{8}$	$+2\frac{1}{8}$	$+1\frac{3}{8}$

7.	$5\frac{1}{4}$	$4\frac{1}{8}$	$3\frac{3}{8}$	$3\frac{1}{8}$	$2\frac{3}{8}$
	$-1\frac{3}{4}$	$-1\frac{5}{8}$	$-1\frac{5}{8}$	$-1\frac{3}{8}$	$-1\frac{7}{8}$

8.	$2\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{2}{3}$	$1\frac{2}{3}$	$2\frac{1}{5}$
	$+2\frac{1}{2}$	$+1\frac{1}{4}$	$+2\frac{1}{3}$	$+1\frac{2}{3}$	$+1\frac{4}{5}$

9.	5	3	3	$3\frac{1}{3}$	4
	$-2\frac{1}{2}$	$-1\frac{3}{4}$	$-2\frac{1}{3}$	$-1\frac{2}{3}$	$-1\frac{4}{5}$

10.	$1\frac{3}{4}$	$1\frac{5}{8}$	$1\frac{5}{8}$	$1\frac{3}{8}$	$1\frac{7}{8}$
	$+1\frac{3}{4}$	$+1\frac{5}{8}$	$+1\frac{5}{8}$	$+1\frac{7}{8}$	$+1\frac{7}{8}$

11.	$3\frac{1}{2}$	$3\frac{2}{3}$	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{3}{4}$
	$-1\frac{3}{4}$	$-1\frac{5}{6}$	$-1\frac{5}{8}$	$-1\frac{7}{8}$	$-1\frac{7}{8}$

44. Written Exercises.

Add the following mixed numbers:

1. $28\frac{3}{8}$

$16\frac{7}{8}$

$22\frac{7}{8}$

$32\frac{4}{8}$

$43\frac{1}{8}$

2. $5\frac{3}{4}$

$16\frac{2}{8}$

$14\frac{3}{10}$

$8\frac{7}{8}$

$5\frac{1}{10}$

3. $27\frac{3}{8}$

$31\frac{5}{8}$

$45\frac{7}{8}$

$15\frac{5}{4}$

$22\frac{5}{8}$

4. $42\frac{1}{8}$

$16\frac{7}{10}$

$7\frac{1}{8}$

$4\frac{1}{10}$

5. $15\frac{3}{8}$

$10\frac{5}{14}$

$12\frac{3}{8}$

$22\frac{2}{11}$

6. $75\frac{3}{8}$

$24\frac{7}{8}$

$26\frac{1}{8}$

$31\frac{1}{8}$

Find remainders:

7. $45\frac{1}{8}$

$- 16\frac{1}{2}$

10. $73\frac{3}{10}$

$- 44\frac{4}{5}$

13. $85\frac{3}{4}$

$- 12\frac{1}{8}$

16. $112\frac{1}{8}$

$- 29\frac{3}{8}$

8. $66\frac{3}{8}$

$- 34\frac{3}{4}$

11. $29\frac{2}{7}$

$- 18\frac{2}{7}$

14. $74\frac{1}{2}$

$- 16\frac{7}{8}$

17. $61\frac{3}{5}$

$- 20\frac{2}{5}$

9. $46\frac{7}{8}$

$- 27\frac{1}{2}$

12. $49\frac{1}{8}$

$- 18\frac{1}{6}$

15. $31\frac{5}{8}$

$- 19\frac{1}{8}$

18. 81

$- 22\frac{5}{8}$

19. $3\frac{1}{8} + 5\frac{1}{2} - 4\frac{1}{8}$

21. $18\frac{2}{5} + 3\frac{1}{2} - 12\frac{3}{4}$

20. $9\frac{1}{8} + 21\frac{1}{4} - 15\frac{1}{8}$

22. $14\frac{1}{8} + 12\frac{1}{2} - 15\frac{1}{8}$

Find the missing terms:

23. $58\frac{1}{4}$

$- ?$

$26\frac{5}{8}$

24. $97\frac{5}{12}$

$- ?$

$33\frac{2}{3}$

25. $37\frac{1}{4}$

$- ?$

$15\frac{3}{14}$

26. $71\frac{4}{5}$

$- ?$

$25\frac{4}{5}$

MULTIPLYING A FRACTION BY AN INTEGER

45. Oral Exercises.

1. How much is 3 times 1 seventh?
2. How much is 5 times 1 eighth?
3. How much is 7 times 1 ninth?
4. Give products:

$2 \times \frac{1}{7}$

$4 \times \frac{1}{7}$

$3 \times \frac{1}{8}$

$5 \times \frac{1}{8}$

$8 \times \frac{1}{9}$

$2 \times \frac{2}{5}$

$3 \times \frac{2}{7}$

$4 \times \frac{2}{9}$

$5 \times \frac{2}{11}$

$3 \times \frac{3}{11}$

To multiply a fraction by an integer, *multiply the numerator by the integer and place the result over the denominator.*

5. $7 \times \frac{3}{8} = ?$

$7 \times \frac{3}{8} = \frac{21}{8} = 4\frac{1}{8}.$

6. Find products:

$4 \times \frac{3}{8}$

$9 \times \frac{4}{7}$

$11 \times \frac{2}{8}$

$9 \times \frac{3}{8}$

$7 \times \frac{5}{8}$

$5 \times \frac{3}{4}$

$8 \times \frac{2}{9}$

$5 \times \frac{5}{8}$

$8 \times \frac{3}{11}$

$12 \times \frac{4}{7}$

7. How much is $14 \times \frac{1}{21}$?

Multiplying the numerator of the fraction by the integer, and then placing the result over the denominator, we find that $14 \times \frac{1}{21} = \frac{14}{21} = \frac{2}{3}$.

We can often shorten the work by canceling.

Write the integer as an improper fraction with 1 for the denominator.

$$14 \times \frac{1}{21} = \frac{\overset{2}{\cancel{14}}}{21} \times \frac{1}{\underset{3}{\cancel{21}}} = \frac{2}{3}$$

8. How much is $6 \times \frac{1}{12}$?

$$6 \times \frac{1}{12} = \frac{6}{12} = \frac{1}{2} \quad \text{or} \quad \frac{\overset{1}{\cancel{6}}}{12} \times \frac{1}{\underset{2}{\cancel{12}}} = \frac{1}{2}$$

9. How much is $12 \times \frac{1}{6}$?

$$12 \times \frac{1}{6} = \frac{12}{6} = 2 \quad \text{or} \quad \frac{12}{1} \times \frac{1}{6} = 2$$

10. How much is $6 \times \frac{5}{12}$?

$$6 \times \frac{5}{12} = \frac{30}{12} = 2\frac{6}{12} = 2\frac{1}{2} \quad \text{or} \quad \frac{6}{1} \times \frac{5}{12} = \frac{5}{2} = 2\frac{1}{2}$$

11. How much is $12 \times \frac{5}{8}$?

$$\frac{12}{1} \times \frac{5}{8} = 10$$

46. Written Exercises.

Find products:

- | | | | | |
|-----------------------------|-----------------------------|-----------------------------|------------------------------|-------------------------------|
| 1. $9 \times \frac{2}{7}$ | 4. $36 \times \frac{2}{3}$ | 7. $15 \times \frac{3}{25}$ | 10. $16 \times \frac{3}{4}$ | 13. $6 \times \frac{7}{36}$ |
| 2. $18 \times \frac{5}{6}$ | 5. $7 \times \frac{11}{14}$ | 8. $42 \times \frac{5}{7}$ | 11. $14 \times \frac{2}{28}$ | 14. $110 \times \frac{7}{10}$ |
| 3. $16 \times \frac{9}{24}$ | 6. $96 \times \frac{5}{8}$ | 9. $16 \times \frac{5}{84}$ | 12. $72 \times \frac{5}{8}$ | 15. $11 \times \frac{1}{44}$ |

MULTIPLYING AN INTEGER BY A FRACTION

1. Find $\frac{2}{3}$ of 15.

$$\frac{1}{3} \text{ of } 15 = 3. \quad \frac{2}{3} \text{ of } 15 = 3 \text{ times } 3, \text{ or } 9.$$

2. Find $\frac{2}{3}$ of 12.

$$\frac{1}{3} \text{ of } 12 = 4. \quad \frac{2}{3} \text{ of } 12 = 2 \text{ times } 4, \text{ or } 8.$$

When the multiplier is a proper fraction, the multiplication sign ($\times$) has the same meaning as *of*.

3. Find $\frac{3}{5}$ of 7.

$$\frac{1}{5} \text{ of } 7 = \frac{7}{5}. \quad \frac{3}{5} \text{ of } 7 = 3 \times \frac{7}{5} = \frac{21}{5} = 4\frac{1}{5}.$$

To multiply an integer by a fraction, *multiply the integer by the numerator and place the product over the denominator.*

4. Find $\frac{3}{10} \times 25$.

SHORTER WAY

$$\frac{3}{10} \times 25 = \frac{75}{10} = 7\frac{5}{10} = 7\frac{1}{2}$$

$$\frac{3}{10} \times \frac{25}{1} = \frac{15}{2} = 7\frac{1}{2}$$

47. Oral Exercises.

Find products:

$\frac{4}{5} \times 25$	$\frac{2}{3} \times 7$	$\frac{3}{4} \times 12$	$\frac{5}{6} \times 7$	$\frac{7}{9} \times 18$
$\frac{7}{8} \times 9$	$\frac{5}{11} \times 44$	$\frac{3}{8} \times 5$	$\frac{3}{10} \times 50$	$\frac{2}{3} \times 10$
$\frac{2}{3} \times 6$ gal.	$\frac{2}{7}$ of 8 ft.	$\frac{4}{5}$ of 5 mi.	$\frac{5}{12}$ of 36 bu.	$\frac{7}{8}$ of \$9

48. Written Exercises.

Find products:

1. $\frac{3}{11} \times 14$	5. $\frac{5}{8} \times 27$	9. $\frac{7}{8} \times 148$	13. $\frac{8}{9} \times 144$
2. $\frac{5}{12} \times 64$	6. $\frac{7}{10} \times 55$	10. $\frac{1}{8} \times 56$	14. $\frac{7}{15} \times 75$
3. $\frac{1}{6} \times 48$ in.	7. $\frac{2}{7} \times 16$ lb.	11. $\frac{7}{8} \times 44$ T.	15. $\frac{5}{8} \times 39$ gal.
4. $\frac{5}{12} \times 240$ yd.	8. $\frac{7}{9} \times 216$ mi.	12. $\frac{4}{7} \times 126$ ft.	16. $\frac{6}{13} \times 273$ oz.

MULTIPLYING AN INTEGER BY A MIXED NUMBER

49. Oral Exercises.

1. What is the cost of $\frac{1}{4}$ lb. butter at \$.32 per pound?

2. What is the cost of $1\frac{1}{4}$ lb. butter at \$.32 per pound?

3. Give products:

$4\frac{1}{3} \times 9$	$2\frac{1}{5} \times 10$	$3\frac{1}{8} \times 12$	$2\frac{1}{7} \times 14$
$2\frac{1}{8} \times 16$	$2\frac{1}{2} \times 20$	$2\frac{1}{3} \times 18$	$2\frac{1}{4} \times 8$

4. What is the cost of $1\frac{1}{2}$ lb. coffee at \$.40 per pound?

5. What is the cost of $1\frac{1}{2}$ yd. of cloth at \$.35 per yard?

6. What is the cost of $5\frac{1}{2}$ lb. of barley at \$.06 per pound?
7. What is the cost of $4\frac{1}{2}$ lb. of cherries at \$.12 per pound?
8. At \$.24 per yard, how much must I pay for $1\frac{1}{8}$ yd. of ribbon?

50. Written Exercises.

1. What is the weight of $5\frac{1}{2}$ packages of tea, each weighing 18 lb.?

18

5½

Write no more figures than appear here. Add $\frac{1}{2}$ of 18 (9) to 5×8 (40).

Ans. 99 (lb.)

Give products:

2. $6\frac{1}{3} \times 27$
4. $7\frac{1}{4} \times 32$
6. $4\frac{1}{7} \times 49$
8. $3\frac{1}{8} \times 48$
3. $7\frac{1}{5} \times 35$
5. $9\frac{1}{6} \times 24$
7. $8\frac{1}{9} \times 63$
9. $7\frac{1}{3} \times 63$

10. What is the cost of $8\frac{1}{4}$ lb. of tea at \$.48 per pound?
11. What is the cost of $7\frac{1}{3}$ yd. of ribbon at \$.25 per yard?
12. What is the cost of $9\frac{1}{3}$ lb. of lamb chops at \$.24 per pound?
13. Find the cost of $19\frac{1}{2}$ lb. of turkey at \$.32 per pound.

$$\begin{array}{r}
 .32 \\
 19\frac{1}{2} \\
 \hline
 16 = \frac{1}{2} \times 32 \\
 288 = 9 \times 32 \\
 32 = 1 \text{ ten} \times 32 \\
 \hline
 \$6.24 \quad \text{Ans.}
 \end{array}$$

Find products:

14. $17\frac{1}{2} \times 48$
15. $25\frac{1}{5} \times 72$
16. $29\frac{1}{6} \times 54$
17. $38\frac{1}{3} \times 45$

18. A manufacturer used $24\frac{1}{4}$ tons of coal per day. How many tons did he use in 25 days?

$$\begin{array}{r}
 25 \\
 24\frac{1}{4} \\
 \hline
 6\frac{1}{4} = \frac{1}{4} \times 25 \\
 100 = 4 \times 25 \\
 50 = 2 \text{ tens} \times 25 \\
 \hline
 \text{Ans. } 606\frac{1}{4} \text{ (T.)}
 \end{array}$$

Give products:

19. $32\frac{1}{2} \times 47$ 20. $29\frac{1}{3} \times 64$ 21. $38\frac{1}{5} \times 76$ 22. $45\frac{1}{8} \times 49$

23. At the rate of 21 bushels per acre, how many bushels of wheat can be grown on $14\frac{5}{8}$ acres?

$$\begin{array}{r} 21 \\ \underline{14\frac{5}{8}} \\ 6 \overline{)105} \\ 17\frac{1}{2} = \frac{5}{8} \times 21 \\ 84 = 4 \times 21 \\ \underline{21} = 1 \text{ ten} \times 21 \end{array}$$

Ans. $311\frac{1}{2}$ (bu.)

Give products:

24. $23\frac{7}{8} \times 36$ 25. $34\frac{3}{10} \times 52$ 26. $18\frac{2}{3} \times 58$ 27. $19\frac{7}{8} \times 25$

MULTIPLYING A MIXED NUMBER BY AN INTEGER

51. Written Exercises.

1. Mr. Sterling travels $14\frac{1}{2}$ miles every day, going to his office and returning home. How far does he travel in the 6 working days of the week?

$$\begin{array}{r} 14\frac{1}{2} \\ 6 \\ \hline \end{array}$$
 Write no more figures than appear here. Add $6 \times \frac{1}{2}$ (3) to 6×4 (24).
 Ans. 87 (mi).

Find products:

2. $8 \times 17\frac{3}{4}$ 3. $9 \times 24\frac{2}{3}$ 4. $5 \times 36\frac{4}{5}$ 5. $6 \times 42\frac{1}{3}$

6. A steamer goes at the rate of $14\frac{3}{4}$ miles an hour. How far will it go in 24 hours?

$$\begin{array}{r} 14\frac{3}{4} \\ 24 \\ \hline 18 = 24 \times \frac{3}{4} \\ 56 = 4 \times 14 \\ \underline{28} = 2 \text{ tens} \times 14 \end{array}$$

Ans. 354 (mi.)

Find products:

7. $28 \times 35\frac{3}{4}$ 8. $25 \times 28\frac{3}{4}$ 9. $36 \times 26\frac{5}{8}$ 10. $24 \times 38\frac{7}{8}$

11. A locomotive uses $86\frac{3}{4}$ lb. of coal per mile. How many pounds will it use in going 74 miles?

$$\begin{array}{r} 86\frac{3}{4} \\ 74 \\ \hline 4 \overline{)222} \\ 55\frac{1}{2} = 74 \times \frac{3}{4} \\ 344 = 4 \times 86 \\ 602 = 7 \text{ tens} \times 86 \end{array}$$

Ans. $6419\frac{1}{2}$ (lb.)

In Ex. 1, the product of $14\frac{1}{2} \times 6 =$ the product of $6 \times 14\frac{1}{2}$.

In Ex. 6, the product of $14\frac{3}{4} \times 24 =$ the product of $24 \times 14\frac{3}{4}$.

In Ex. 11, the product of $86\frac{3}{4} \times 74 =$ the product of $74 \times 86\frac{3}{4}$.

In multiplying an integer by a mixed number, or a mixed number by an integer, we may take either the mixed number or the integer for the multiplicand.

The work is sometimes made easier by making the larger number the multiplicand.

Find products:

12. $28\frac{1}{4} \times 56$

14. $18\frac{3}{8} \times 189$

16. $35\frac{3}{8} \times 262$

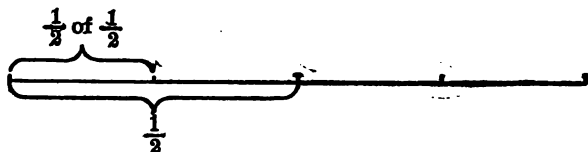
13. $69\frac{7}{8} \times 36$

15. $54\frac{7}{8} \times 24$

17. $72\frac{3}{10} \times 52$

MULTIPLYING A FRACTION BY A FRACTION

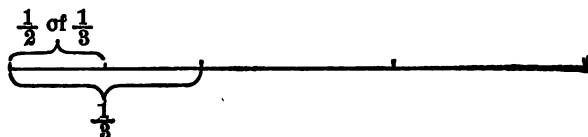
52. Oral Exercises



1. How much is $\frac{1}{2}$ of $\frac{1}{2}$ of the above line?



2. How much is $\frac{1}{2}$ of $\frac{1}{4}$ of the above line?



3. How much is $\frac{1}{2}$ of $\frac{1}{3}$ of the above line?



4. How much is $\frac{1}{2}$ of $\frac{1}{5}$ of the above line?

5. How many $\frac{1}{4}$'s are there in $\frac{1}{2}$? How many $\frac{1}{6}$'s in $\frac{1}{3}$?
How many $\frac{1}{10}$'s in $\frac{1}{5}$?

6. When the numerator of a fraction remains the same and the denominator is doubled, what is the effect on the value of the fraction?

7. Give answers:

$$\frac{1}{2} \text{ of } \frac{1}{2}$$

$$\frac{1}{2} \text{ of } \frac{1}{4}$$

$$\frac{1}{2} \text{ of } \frac{1}{3}$$

$$\frac{1}{2} \text{ of } \frac{1}{5}$$

$$\frac{1}{2} \text{ of } \frac{1}{6}$$

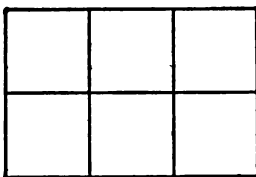
$$\frac{1}{2} \text{ of } \frac{1}{7}$$

8. Divide a circle into 4 equal parts and find out how much is $\frac{1}{2}$ of $\frac{1}{4}$ of the circle.

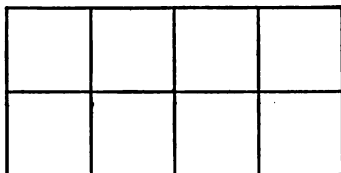
9. Divide a circle into 2 equal parts and find out how much is $\frac{1}{3}$ of $\frac{1}{2}$ of the circle.



10. Draw lines showing $\frac{1}{4}$ of $\frac{1}{2}$ of the above line.



11. How many squares are there in $\frac{1}{3}$ of the above figure?
12. What part of the figure is $\frac{1}{2}$ of $\frac{1}{3}$ of it?
13. How many squares in $\frac{1}{2}$ of the above figure?
14. What part of the figure is $\frac{1}{3}$ of $\frac{1}{2}$ of it?



15. What part of the above figure is $\frac{1}{2}$ of $\frac{1}{4}$ of it?
- What part of the above figure is $\frac{1}{4}$ of $\frac{1}{2}$ of it?

16. Give answers:

$$\frac{1}{2} \text{ of } \frac{1}{4}$$

$$\frac{1}{4} \text{ of } \frac{1}{2}$$

$$\frac{1}{2} \text{ of } \frac{1}{3}$$

$$\frac{1}{3} \text{ of } \frac{1}{2}$$

$\frac{2}{3}$ of 6 may be written $\frac{2}{3} \times 6$, the sign $\times$ being read "of."

We have seen from the diagrams that

$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

$$\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$$

$$\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$

$$\frac{1}{2} \times \frac{1}{5} = \frac{1}{10}$$

In every one of these examples we can get the same answer by multiplying the numerators of the two fractions for the numerator of the answer, and the denominators of the two fractions for the denominator of the answer.

17. Give answers:

$$\frac{1}{4} \text{ of 2 cents}$$

$$\frac{1}{2} \text{ of 2 thirds}$$

$$\frac{1}{2} \text{ of } \frac{2}{3}$$

$$\frac{1}{2} \text{ of } \frac{2}{5}$$

$$\frac{1}{2} \text{ of } \frac{2}{7}$$

$$18. \frac{1}{2} \times \frac{2}{3} = ? \quad \frac{1}{2} \times \frac{2}{5} = ? \quad \frac{1}{2} \times \frac{2}{7} = ?$$

In Ex. 18, multiply the numerators of the fractions for the numerator of the answer, and the denominators of the fractions for the denominator of the answer. Reduce the answers to lowest terms and compare the answers with the answers of the same examples in Ex. 17.

19. Give answers:

$$\frac{1}{3} \text{ of 3 cents} \quad \frac{1}{3} \text{ of 3 fifths} \quad \frac{1}{3} \text{ of } \frac{3}{5} \quad \frac{1}{3} \text{ of } \frac{3}{7} \quad \frac{1}{3} \text{ of } \frac{3}{10}$$

$$20. \frac{1}{3} \times \frac{3}{5} = ? \quad \frac{1}{3} \times \frac{3}{7} = ? \quad \frac{1}{3} \times \frac{3}{10} = ?$$

Find answers by multiplying the numerators for the numerator of the answer, and the denominators for the denominator of the answer. Reduce the answers to lowest terms and compare the answers with the answers of the same examples in Ex. 19.

21. Give answers:

$$\frac{3}{4} \text{ of 8 cents} \quad \frac{3}{4} \text{ of 8 elevenths} \quad \frac{3}{4} \text{ of } \frac{8}{11} \quad \frac{3}{4} \text{ of } \frac{4}{9} \quad \frac{3}{4} \text{ of } \frac{4}{5}$$

$$22. \frac{3}{4} \text{ of } \frac{8}{11} = ? \quad \frac{3}{4} \text{ of } \frac{4}{9} = ? \quad \frac{3}{4} \text{ of } \frac{4}{5} = ?$$

In Ex. 22, multiply the numerators for the numerator of the answer, and the denominators for the denominator of the answer. Reduce to lowest terms and compare the answers with the answers of the same examples in Ex. 21.

23. Multiply $\frac{3}{5}$ by $\frac{1}{5}$.

$$\frac{3}{5} \times \frac{1}{5} = \frac{3}{25}$$

To multiply a fraction by a fraction, *cancel if possible*. Multiply the numerators together for the numerator of the product and the denominators together for the denominator of the product.

24. Give answers at sight:

$$\begin{array}{ccccc} \frac{1}{2} \times \frac{6}{11} & \frac{1}{3} \times \frac{6}{7} & \frac{2}{3} \times \frac{6}{11} & \frac{1}{4} \times \frac{8}{9} & \frac{1}{7} \times \frac{7}{8} \\ \frac{3}{4} \times \frac{12}{13} & \frac{1}{5} \times \frac{10}{13} & \frac{2}{5} \times \frac{7}{8} & \frac{3}{5} \times \frac{1}{6} & \frac{3}{7} \times \frac{7}{9} \\ \frac{4}{5} \times \frac{15}{17} & \frac{1}{6} \times \frac{18}{19} & \frac{5}{6} \times \frac{7}{10} & \frac{2}{7} \times \frac{14}{15} & \frac{5}{7} \times \frac{14}{15} \end{array}$$

MULTIPLYING A MIXED NUMBER BY A FRACTION OR ANOTHER MIXED NUMBER

53. Oral Exercises.

1. Multiply $1\frac{1}{2}$ by $\frac{1}{2}$.

Change $1\frac{1}{2}$ to an improper fraction. $1\frac{1}{2} = \frac{3}{2}$.

$$1\frac{1}{2} \times \frac{1}{2} = \frac{3}{2} \times \frac{1}{2} = \frac{3}{4} \quad \text{Ans.}$$

2. Multiply $3\frac{1}{2}$ by $3\frac{1}{3}$.

Change $3\frac{1}{2}$ and $3\frac{1}{3}$ to improper fractions.

$$3\frac{1}{2} \times 3\frac{1}{3} = \frac{7}{2} \times \frac{10}{3} = \frac{35}{3} = 11\frac{2}{3} \quad \text{Ans.}$$

3. Give answers:

$1\frac{1}{2} \times \frac{1}{3}$

$1\frac{2}{3} \times \frac{1}{3}$

$2\frac{1}{2} \times \frac{1}{10}$

$1\frac{1}{2} \times \frac{2}{3}$

$2\frac{1}{4} \times \frac{1}{9}$

$5\frac{1}{2} \times \frac{1}{11}$

$4\frac{2}{3} \times \frac{1}{14}$

$2\frac{2}{3} \times \frac{1}{8}$

$1\frac{1}{2} \times 1\frac{1}{2}$

$1\frac{1}{3} \times 1\frac{1}{3}$

$1\frac{1}{4} \times 1\frac{1}{2}$

$1\frac{1}{4} \times 1\frac{1}{3}$

$2\frac{1}{2} \times 1\frac{1}{2}$

$3\frac{1}{3} \times 1\frac{1}{3}$

$4\frac{1}{2} \times 1\frac{1}{4}$

$1\frac{1}{5} \times 1\frac{1}{2}$

54. Written Exercises.

Find products:

1. $3\frac{2}{3} \times 2\frac{1}{3}$

4. $5\frac{2}{3} \times 1\frac{2}{3}$

7. $2\frac{5}{8} \times 2\frac{2}{3}$

2. $5\frac{1}{4} \times 2\frac{2}{3}$

5. $2\frac{4}{5} \times 1\frac{2}{3}$

8. $7\frac{1}{8} \times \frac{4}{9}$

3. $4\frac{1}{4} \times 2\frac{2}{3}$

6. $6\frac{3}{4} \times \frac{8}{9}$

9. $8\frac{2}{3} \times 1\frac{3}{13}$

10. $\frac{1}{2} \times \frac{4}{5} \times \frac{15}{16}$

12. $\frac{3}{4} \times \frac{5}{9} \times \frac{7}{25}$

14. $3\frac{2}{3} \times \frac{7}{8} \times 1\frac{5}{11}$

11. $\frac{2}{3} \times \frac{7}{8} \times \frac{12}{19}$

13. $4\frac{1}{5} \times \frac{5}{7} \times 1\frac{2}{3}$

15. $1\frac{7}{8} \times 5\frac{2}{3} \times 2\frac{3}{4}$

BILLS

55. Written Exercises.

1. You buy the following goods from B. Altman & Co., 5th Av. and 34 St.: $3\frac{1}{2}$ yd. velvet @ \$1.50; $1\frac{1}{4}$ yd. lace @ \$1.60; 4 yd. silk braid @ \$.45; 18 buttons @ \$.60.

Make out the bill, supply the dates, use no unnecessary words. William Black, a clerk, receipts the bill.

2. Make out a bill for the following goods that you have bought from some drygoods dealer whose name and address you know. A clerk receipts the bill.

30 yd. muslin @ \$.14; 6 handkerchiefs @ \$.25; 12 yd. gingham @ \$.12; 2 pr. gloves @ \$.90.

3. Make out a bill for the following:

Mrs. C. Shaw of 12 Sylvan Terrace, on Dec. 1, 1917, bought of Park & Tilford, 5th Av. and 26 St., these goods:

12 oranges @ \$.05 $1\frac{1}{2}$ lb. cheese @ \$.30

2 lb. sausage @ \$.32 $\frac{1}{2}$ lb. pepper @ \$.50

The bill was sent Dec. 6. Charles Gale, a clerk, receipted it.

4. Ann Fuller of 167 West 22 St. and three other girls formed a tennis club and bought the following from A. G. Spaulding & Co., 520 Fifth Av.

1 tennis net @ \$5.50 4 tennis rackets @ \$3.50

4 pr. canvas shoes @ \$1.25 1 doz. tennis balls @ \$.35

Make out the bill, supply dates, and receipt the bill as though you were the clerk.

56. Oral Problems.

1. A watch loses $2\frac{1}{2}$ minutes every 2 hours. How much will it lose in a day?

2. A carpenter works 8 hours a day and earns \$.50 an hour. How much can he earn in $\frac{3}{4}$ of a working day?

3. If 4 girls can make a dress in $1\frac{1}{2}$ days, how long will it take one girl to make it?

4. A grocer had $\frac{3}{4}$ of a gallon of oil in one can and $\frac{1}{3}$ of a gallon in another. How much oil did he have in both cans?

5. If it requires $2\frac{1}{2}$ yd. of table damask to make one tablecloth, how many yards will it take to make 6 tablecloths?

6. Roy had a half dollar. By carrying packages, he earned a dime and a nickel. How much more does he need to make a dollar?

7. On Saturday night the ticket seller at a 10-cent moving picture show sold \$135 worth of tickets. How many tickets did he sell?

8. John had 2 strings. One was $\frac{7}{8}$ ft. long, and the other $\frac{5}{8}$ ft. long. He tied them together. Allowing $\frac{1}{8}$ ft. for the knot, how long a string did he then have?

9. When eggs are 60¢ per dozen, how many dozen can I buy for \$2.40?

10. Jane wishes to buy 4 yd. of ribbon at 15¢ a yard. She now has \$.25. How much more money does she need?

11. Alice saved $\frac{1}{5}$ of her salary for 6 weeks, and with her savings bought a coat for \$18. How much does she earn in a week?

12. Maude bought 6 yd. of velvet at \$.40 per yard. She received \$.60 in change. How much did she give in payment for the velvet?

13. A printer received \$3.60 for 9 hours' work. How much did he receive per hour?

14. Two boys made lemonade at a cost of $\frac{1}{2}$ cent a glass and sold it for 3 cents a glass. What was their profit on 12 glasses?

15. If $\frac{1}{2}$ lb. of meat costs \$.18, what will $1\frac{1}{2}$ lb. cost?

16. Frieda bought 60 oranges. She divided $\frac{1}{3}$ of these among 4 girls. How many oranges did she give to each girl?

17. A class is told to draw a rectangle 3 inches wide and $2\frac{1}{2}$ times as long as it is wide. How long should it be?

18. The length of a rectangle is 6 inches; the width is $\frac{3}{4}$ of the length. What is the width?

19. A baker charges 5 cents for a quarter of a pie. How much will he receive for $3\frac{3}{4}$ pies?

20. If it takes $\frac{3}{4}$ of a yard of toweling to make 1 towel, how many yards will be required to make 16 such towels?

21. A girl saves \$ $1\frac{1}{2}$ a week. At this rate, how long would it take her to save \$15?

22. A cast-iron drain pipe weighs $7\frac{3}{4}$ lb. to the foot. What will be the weight of a piece of this pipe 12 feet long?

57. Oral Problems.

NOTE TO THE TEACHER. — It is suggested that the pupils be instructed to write, at a given signal, the answers to these related oral problems. They should be permitted to glance at preceding answers if they wish to do so.

WINTER CAPS

1. Last year the regular wholesale price of winter caps was 80¢ each. At the end of the season they were sold for $\frac{3}{4}$ of this price. For how much were they sold at the end of the season?

2. What would be the cost of 150 of these caps at the reduced price?

3. I bought \$30 worth of these caps at the reduced price. How many did I buy?

4. I held these caps until the following winter and then sold them at \$ $1\frac{1}{2}$ each. How much did I gain on the lot?

THE MOVING MAN

5. A man who owns a moving van hires two helpers, one at $\$2\frac{1}{2}$ a day and one at $\$3$ a day. What daily wages does he pay? What are the weekly wages of the two men, counting 6 days to the week?

6. During the week these men move the goods of 8 families at an average charge of $\$12\frac{1}{2}$ a family. What was obtained for this work?

7. How much is left for the van owner after wages are paid?

8. Besides wages, the employer pays $\$2\frac{1}{2}$ a day for 6 days a week for other expenses. What is the weekly profit of the van owner?

BUYING CLOTHES

9. John's mother buys him a suit of clothes, paying $\$8\frac{1}{2}$ for it. This was $\$3\frac{1}{2}$ less than the suit was marked last week. What was it marked last week?

10. She also buys a suit for her boy James, paying $\$3\frac{1}{2}$ less than she paid for John's suit. What was the cost of James' suit?

11. What was paid for both suits together?

12. A 20-dollar bill was given in payment. How much change was received?

A WALKING CLUB

13. The members of a walking club walk a mile in 20 minutes. At this rate, how far can they go in 2 hours?

14. At the same rate, how long will it take them to walk 4 miles?

15. If they start out at 9 o'clock in the morning and stop one hour to rest, how far from the starting point will they be at 3 P.M.?

MARY SIMONS' PARTY

16. 30 children were at Mary Simons' party. Each child was served with a sandwich, consisting of a slice of chicken and two slices of bread. How many loaves of bread were used for the sandwiches if each loaf was cut into 10 slices?

17. 9 quarts of lemonade were served. If a glass contained one half pint, how many glasses of lemonade were served?

18. Mary's mother bought $3\frac{1}{4}$ lb. of chocolate cake at \$.20 a pound and $2\frac{1}{2}$ doz. cookies at 1¢ each. How much money did she spend for cake?

19. The cocoanut candy cost 40¢, the lemon candy cost 10¢, and the peppermint candy cost 75¢. How much was spent for candy?

58. Written Problems.

1. At the rate of $57\frac{3}{4}$ miles an hour, how far will an airship travel in $2\frac{1}{2}$ hours?

2. A tunnel which is being put through the Canadian Rockies will cost \$10,000,000 when completed. $\frac{3}{8}$ of the tunnel has been completed and paid for. How much money has been expended?

3. If it takes $3\frac{4}{5}$ yd. of cloth to make one coat, how many yards will it take to make 42 coats?

4. At a Sunday school festival 306 children were served with ice cream. Each child received $\frac{1}{3}$ of a quart. How much did the ice cream cost at the rate of 36¢ a quart?

5. At the rate of $\frac{7}{8}$ of an inch of wire for one nail, how many yards of wire will be needed to make 640 nails?

6. A house painter earns $\$3\frac{4}{5}$ a day. How much can he earn in $16\frac{1}{4}$ days?

7. Find the cost of preparing for a picnic a basket containing
- | | |
|------------------------|-----------------|
| 6 loaves of bread | at 5¢ a loaf. |
| 2 lb., 4 oz. of tongue | at 60¢ a pound. |
| 1½ lb. of butter | at 44¢ a pound. |
| 3½ lb. of cake | at 40¢ a pound. |
8. Find the cost of $\frac{3}{8}$ of a ton of ice at the rate of \$.30 for 100 pounds.
9. A man gains \$57.75 in 18 days. At this rate, how much will he gain in 54 days?
10. How much will it cost to plaster a wall 18 ft. by 9 ft. at \$.30 a square yard?
11. If 30 lb. of butter cost \$12.60, what will 10 lb. cost?
12. If a chicken weighing $4\frac{1}{2}$ lb. costs \$1.25, what will 18 lb. of chicken cost at the same rate?
13. The doctor wishes Mr. Smith to increase his weight until he weighs 164 lb. At present he needs to gain 14 lb. and 4 oz. How much does he weigh now?
14. John earns \$15.50 a week. Jo earns \$12.75 a week. In one year, or 52 weeks, how much more will John earn than Jo?
15. I bought 15 yd. of lace at \$.12½ a yard. The salesman gave me \$.15 change. How much had I given him?
16. At 2½ cents per mile, how much railroad fare must a family consisting of father, mother, and 2 children pay for a journey of 324 miles, if the children pay only half fare?
17. A man earns \$5,000 a year. His expenses average \$260 a month. At this rate, how much will he save in 5 years?
18. In a school on the last day of September, there were 3,463 children. During October 425 children were admitted and 217 were discharged. How many children were on the register the last day of October?

19. Mr. Walsh paid \$3,795 for a lot. On it he built a house for \$6,156.75 and a garage for \$597.50. The pavement for the sidewalk cost him \$83.50. He sold all at a gain of \$1,965. What was the selling price?

20. A man earned \$236.38 each month. He spent \$127.62 each month. How much did he save in a year and a half?

21. A merchant bought two pieces of cloth, one containing $57\frac{1}{4}$ yards, the other $49\frac{7}{8}$ yards. He sold $15\frac{1}{2}$ yards, $16\frac{1}{3}$ yards, and $11\frac{5}{8}$ yards. How many yards remained?

22. Mr. Richards bought 9 city lots for \$36,000. He sold them for \$4,550 each. How much did he gain?

23. A peddler paid \$53.80 for a job lot of 380 pieces of china. If he sells them at the rate of \$.25 each, how much will he gain?

24. How much will it cost to paint a ceiling 26 ft. by 17 ft. at \$.09 a square foot?

25. A fruit dealer is selling oranges at 6 for \$.25. He paid 3¢ apiece for them. What is his profit on 100 doz. oranges?

26. A baker sells stale bread at the rate of 2 loaves for 7¢. If he takes in \$1.75, how many loaves will he have sold?

27. At a recent sale, coffee was sold at the rate of 3 lb. for \$1.00. Mrs. Pratt bought 24 lb. How much cheaper was this than if she had paid the usual price of \$.38 per pound?

28. I bought 16 yd. of lace and received \$.60 change from \$5.00. How much was the lace a yard?

29. An agent started out to collect \$2,051.75 for rent. He returned with \$1,876.60. How much did he fail to collect?

2. The wire used for each hat frame averaged 4 yards. How many frames did they make with the wire purchased?

3. They used an average of $\frac{1}{2}$ yard of crinoline for each frame. How many yards were needed to cover all the frames? What was the cost of the crinoline at 10 cents a yard?

4. Two fifths of the hats required $1\frac{1}{4}$ yards each of velvet for covering; the remainder required $1\frac{1}{2}$ yards each. Find the number of yards of velvet required for all.

5. The velvet cost \$1.50 per yard. Find the cost of the velvet required.

6. Ribbons and flowers cost 75 cents for each hat. How much must be spent for ribbons and flowers on all the hats?

7. How much money was spent on the entire lot of finished hats?

8. Two fifths of the finished hats were sold at \$4.75 each. What was received for these?

9. The remainder were sold at \$5.50 each. What was received for this lot?

10. How much was received for both lots?

11. What was the entire profit?

BUYING COAL

12. On April 1st, the price of coal was \$6.25 a ton. The price was increased 10 cents a ton on the first of each succeeding month up to and including September 1st. What was the price per ton during September?

13. A householder put in $5\frac{3}{4}$ tons of stove coal and $7\frac{1}{2}$ tons of furnace coal April 1st. If the price per ton was the same for both kinds of coal, what was the entire cost?

14. What would be the cost of this amount of coal on September 30th?

15. How much was saved on this coal by buying it April 1st, instead of September 30th?

16. How many tons can be obtained for \$75 on April 1st?

17. How many tons can be obtained for \$81 after September 1st?

18. A family bought coal by the bag, paying 60 cents per 100 pounds. At this rate, what did the family pay for a ton of this coal? (2000 lb. = 1 ton).

19. How much could the family save per ton by buying by the ton during the month of April? How much would be saved by buying $3\frac{1}{2}$ tons during April?

20. How much would be saved on a ton if bought at September prices instead of by the bag at 60 cents a hundred pounds?

THIRD QUARTER

COUNTING

61. Oral Exercises.

1. Beginning with 5, count by 8's to 101.
2. Beginning with 6, count by 5's to 101.
3. Beginning with 7, count by 5's to 102.
4. Beginning with 9, count by 6's to 105.

ADDITION

62. Oral Exercises.

Give answers :

60 + 50 + 15	70 + 30 + 25	30 + 90 + 16
40 + 80 + 12	60 + 60 + 17	80 + 30 + 19
90 + 40 + 18	40 + 70 + 14	50 + 50 + 21
70 + 50 + 29	80 + 50 + 28	50 + 90 + 22

63. Written Exercises.

1. 46,524	2. \$ 96.25	3. 75,402
3,465	280.03	6,584
72,728	473.57	134,628
10,346	606.79	50,073
793	342.12	276,421
35,740	55.46	91,339
4,826	827.34	83,265
7,205	510.60	487,157
21,369	134.83	27,813
<u>19,051</u>	<u>268.29</u>	<u>216,096</u>

Add :

4. Fifty-six thousand three hundred twenty-one,
 Four thousand six hundred eighty-nine,
 Forty-two thousand five hundred fifty-three,
 Seventy-three thousand one hundred seven,
 Thirty-one thousand sixty-four,
 One hundred ninety-five,
 Eighty-nine thousand two hundred forty-eight,
 Twenty-five thousand seven hundred thirty-four,
 Ninety thousand three hundred eighty,
 Seventeen thousand seventy-six.

5. Two hundred sixty-five dollars and twenty-five cents,
 Four hundred seventy-six dollars and thirty-eight cents,
 Nine hundred dollars and seventy-six cents,
 Two thousand three hundred three dollars and ninety-seven cents,

Five hundred ninety-two dollars and five cents,
 Seven dollars and forty-six cents,
 Seven hundred eighty-six dollars and eighty-seven cents,
 Nine hundred dollars,
 Three hundred fifty-two dollars and fifty-four cents,
 Four hundred ninety-six dollars and thirty-nine cents.

6. \$ 380.67	7. 6,595,768	8. \$34,520.24
296.81	6,458,407	41,253.02
457.53	9,628,295	25,126.78
134.05	3,281,374	43,615.54
217.50	11,305,932	96,307.85
514.46	5,413,761	20,891.21
2.79	2,234,123	74,769.43
<u>601.30</u>	<u>20,522,657</u>	<u>57,343.67</u>

9. In 1914, 17,934,982 pupils attended the elementary public schools in the United States; 1,241,218 attended the public high schools; 189,646 attended public colleges; 738,842 attended public special schools; 2,357,654 attended private schools. Find the total number of pupils receiving instruction in these institutions in the United States in 1914.

10. Find the number of square miles on the earth's surface that are covered by the following bodies of water:

Pacific Ocean	71,000,000 sq. mi.
Atlantic Ocean	34,000,000 sq. mi.
Indian Ocean	28,000,000 sq. mi.
Antarctic Ocean	7,500,000 sq. mi.
Arctic Ocean	4,000,000 sq. mi.

11. Find the total population of the continents:

North America	129,353,000
South America	48,630,000
Europe	452,161,000
Asia	949,730,000
Africa	140,938,000
Australia	7,323,000

12. Find the number of square miles of land on the surface of the globe:

North America	7,146,641 sq. mi.
South America	7,344,508 sq. mi.
Europe	3,671,624 sq. mi.
Asia	17,470,282 sq. mi.
Africa	11,632,000 sq. mi.
Australia	3,456,290 sq. mi.
Polar lands	6,970,000 sq. mi.

13. For the weeks ending Nov. 28th, Dec. 5th, and Dec. 12th, in 1913, the number of immigrants landed in this country was 21,289, 15,687, and 32,916. How many immigrants landed in this country during these three weeks?

14. For the three weeks ending Nov. 27th, Dec. 4th, and Dec. 11th, in 1915, the number of immigrants landed in this country was 2,058, 1,114, and 2,075. How many immigrants landed in this country during these three weeks?

15. 205	16. \$6.25	17. 196
826	8.03	813
370	5.35	557
425	4.79	326
827	2.12	133
634	6.54	642
395	2.72	424
474	6.01	628
628	8.43	457
213	6.82	632
908	5.10	469
<u>334</u>	<u>2.73</u>	<u>207</u>

Add:

18. Seventy thousand four hundred ninety-eight,
 Fifty-six thousand seventy-four,
 Forty thousand eight hundred forty-seven,
 Ninety-two thousand nine hundred eighty-three,
 Twenty-three thousand seven hundred six,
 Fifteen thousand six hundred fifty,
 Nine thousand six hundred seventy-eight,
 Twenty-eight thousand five hundred twenty-three,
 Thirty-seven thousand two hundred thirty-five,
 Forty-five thousand four hundred sixty-two.

19. Two hundred eighty dollars and fifty-eight cents,
 Ninety-six dollars and ninety-one cents,
 Three hundred fifty-seven dollars and forty-nine cents,

Two hundred thirty-three dollars and fifty-six cents,
 One hundred dollars and fifty-four cents,
 Six hundred seven dollars and seventy-two cents,
 Four hundred seventy-nine dollars and sixty-two cents,
 Eight hundred thirty-three dollars and nine cents,
 Five hundred sixty-four dollars and thirty-four cents,
 Seven hundred forty-two dollars and twenty-three cents.

20. 47,464	21. \$321.07
2,882	329.87
10,476	634.93
865	479.86
35,347	534.65
93,035	729.84
28,328	290.38
66,269	368.27
51,642	543.92
<u>27,903</u>	<u>368.39</u>

SUBTRACTION

64. Oral Exercises.

1. Subtract :

91 - 29	55 - 26	73 - 25
37 - 18	46 - 27	63 - 36
52 - 38	61 - 29	64 - 45
85 - 58	74 - 47	82 - 34

2. Supply the missing numbers :

27 + ? = 65	44 + ? = 83	29 + ? = 72
35 + ? = 54	47 + ? = 85	33 + ? = 92
27 + ? = 56	18 + ? = 42	34 + ? = 63
25 + ? = 74	51 + ? = 86	64 + ? = 97

65. Written Exercises.

1.	\$5,790,682.05	2.	32,007,567	3.	950,764,200
	<u>— 2,810,391.94</u>		<u>— 99</u>		<u>— 536,132,112</u>

4. The minuend is three million seven hundred ninety-eight thousand seventy-three dollars and four cents, and the subtrahend is one million six hundred forty-six thousand one hundred sixty-one dollars and twelve cents. What is the remainder?

5. From four hundred fifty-three million two hundred ninety-six thousand four hundred eight subtract nine hundred seventeen thousand three hundred twenty-five.

6. A man earned \$7,525 in a year. He saved \$4,853.18. How much did he spend?

7. The population of Maine is 742,371. The population of Vermont is 355,956. How much greater than the population of Vermont is the population of Maine?

8. The Mississippi basin has an area of 1,250,000 square miles. The area of the basin of the Amazon is 2,320,000 square miles. How much larger is the basin of the Amazon than the basin of the Mississippi?

9. Vermont contains 9,564 square miles. Massachusetts contains 8,266 square miles. How much larger than Massachusetts is Vermont?

Name and supply the missing terms :

10.	78,654,923	11.	?	12.	127,514,323
	<u>— ?</u>		<u>— 92,767,558</u>		<u>— ?</u>
	44,725,431		73,978,367		38,305,202

Find the missing numbers :

13.	86,078	14.	674,402	15.	373,444
	<u>+ ?</u>		<u>+ ?</u>		<u>+ ?</u>
	105,047		965,603		784,855

MULTIPLICATION

66. Oral Exercises.

Give products at sight :

$\begin{array}{r} 95 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 72 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 81 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 35 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 26 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 44 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 52 \\ \times 8 \\ \hline \end{array}$
---	---	---	---	---	---	---

$\begin{array}{r} 31 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 41 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 91 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 82 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 46 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 75 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 39 \\ \times 3 \\ \hline \end{array}$
---	---	---	---	---	---	---

$\begin{array}{r} 57 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 88 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 75 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 90 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 65 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 66 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 36 \\ \times 9 \\ \hline \end{array}$
---	---	---	---	---	---	---

67. Written Exercises.

1. $\$178,325.63 \times 18$

3. $16,739,578 \times 16$

2. $35,698,477 \times 9$

4. $\$214,568.19 \times 17$

Multiply :

5. $\begin{array}{r} 720,754 \\ 709 \\ \hline \end{array}$

9. $\begin{array}{r} 7,684 \\ 4,390 \\ \hline \end{array}$

13. $\begin{array}{r} 8,275 \\ 6,004 \\ \hline \end{array}$

6. $\begin{array}{r} \$2,753.48 \\ 608 \\ \hline \end{array}$

10. $\begin{array}{r} \$645.36 \\ 3770 \\ \hline \end{array}$

14. $\begin{array}{r} \$537.92 \\ 4009 \\ \hline \end{array}$

7. $\begin{array}{r} 50,387 \\ 530 \\ \hline \end{array}$

11. $\begin{array}{r} 8,469 \\ 6,070 \\ \hline \end{array}$

15. $\begin{array}{r} 430,275 \\ 984 \\ \hline \end{array}$

8. $\begin{array}{r} \$840.72 \\ 470 \\ \hline \end{array}$

12. $\begin{array}{r} \$578.83 \\ 4080 \\ \hline \end{array}$

16. $\begin{array}{r} \$209.18 \\ 7876 \\ \hline \end{array}$

17. $\begin{array}{r} 73,596 \\ 676 \\ \hline \end{array}$

18. $\begin{array}{r} \$2,534.47 \\ 846 \\ \hline \end{array}$

DIVISION

68. Oral Exercises.

At the rate of 30 miles an hour, in how many hours will an automobile go 90 miles?

$$\begin{array}{r} 30 \overline{)90} \\ \text{Ans.} \quad 3(\text{hr.}) \end{array}$$

1. Give quotients at sight:

$$50 \overline{)150}$$

$$40 \overline{)160}$$

$$60 \overline{)240}$$

$$90 \overline{)810}$$

$$80 \overline{)640}$$

$$70 \overline{)560}$$

$$50 \overline{)600}$$

$$10 \overline{)1,000}$$

$$110 \overline{)1,210}$$

$$110 \overline{)1,320}$$

2. Give answers:

$$\frac{75}{6}$$

$$\frac{91}{7}$$

$$\frac{98}{8}$$

$$\frac{115}{9}$$

$$\frac{121}{10}$$

$$\frac{84}{5}$$

$$\frac{80}{6}$$

$$\frac{99}{7}$$

$$\frac{100}{8}$$

$$\frac{111}{9}$$

69. Written Exercises.

How many of the following examples in division can you work correctly in 10 minutes?

1. $594,753,572 \div 6$

11. $146,347,899 \div 48$

2. $\$987,649.88 \div 7$

12. $\$976,953.96 \div 459$

3. $87,543,356 \div 8$

13. $187,543,989 \div 57$

4. $\$8,879.67 \div 9$

14. $\$1,759,936.32 \div 288$

5. $8,753,862 \div 9$

15. $293,764,877 \div 63$

6. $\$9,899.92 \div 8$

16. $8,490,339 \div 351$

7. $69,783,469 \div 63$

17. $\$362,865,635 \div 3,245$

8. $\$857,837.95 \div 433$

18. $8,760,805 \div 95$

9. $82,973,645 \div 70$

19. $493,686,576 \div 657$

10. $\$954,873.36 \div 324$

20. $9,508,048 \div 7,832$

REDUCTION OF FRACTIONS

70. Oral Exercises.

1. Reduce at sight to lowest terms:

$$\frac{16}{20} \quad \frac{8}{24} \quad \frac{14}{28} \quad \frac{6}{30} \quad \frac{20}{32} \quad \frac{17}{34} \quad \frac{6}{36} \quad \frac{34}{38}$$

$$\frac{18}{20} \quad \frac{12}{28} \quad \frac{9}{30} \quad \frac{18}{30} \quad \frac{6}{32} \quad \frac{24}{32} \quad \frac{8}{36} \quad \frac{2}{22}$$

2. Change to thirty-fifths: $\frac{1}{5}$, $\frac{2}{5}$, $\frac{5}{5}$, $\frac{1}{7}$, $\frac{2}{7}$, $\frac{4}{7}$.

3. Change to thirty-sixths:

$$\frac{1}{2} \quad \frac{1}{4} \quad \frac{1}{6} \quad \frac{1}{8} \quad \frac{1}{12} \quad \frac{1}{18}$$

$$\frac{3}{4} \quad \frac{5}{6} \quad \frac{7}{8} \quad \frac{11}{12} \quad \frac{5}{9} \quad \frac{5}{18}$$

4. Change to forty-seconds:

$$\frac{1}{2}, \frac{1}{3}, \frac{1}{6}, \frac{1}{7}, \frac{1}{14}, \frac{2}{21}, \frac{2}{3}, \frac{5}{6}, \frac{3}{7}, \frac{5}{14}, \frac{6}{21}, \frac{11}{21}$$

5. Change to forty-fifths:

$$\frac{1}{3}, \frac{1}{5}, \frac{1}{9}, \frac{1}{15}, \frac{2}{3}, \frac{3}{5}, \frac{7}{9}, \frac{4}{15}, \frac{7}{15}, \frac{11}{15}, \frac{14}{15}, \frac{8}{9}$$

71. Written Exercises.

In reducing fractions to lowest terms, remember that

When the sum of the digits that make up a number is divisible by 9, the number itself is divisible by 9.

Reduce to lowest terms:

$$1. \frac{18}{99} \quad 4. \frac{45}{171} \quad 7. \frac{81}{333} \quad 10. \frac{117}{477} \quad 13. \frac{126}{531}$$

$$2. \frac{36}{153} \quad 5. \frac{63}{261} \quad 8. \frac{72}{279} \quad 11. \frac{108}{423} \quad 14. \frac{153}{639}$$

$$3. \frac{27}{117} \quad 6. \frac{54}{207} \quad 9. \frac{90}{369} \quad 12. \frac{135}{149} \quad 15. \frac{144}{603}$$

ADDITION AND SUBTRACTION OF FRACTIONS

72. Oral Exercises.

Give answers at sight:

$$\begin{array}{r}
 1. \quad \frac{1}{2} \\
 + \frac{1}{4} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{2} \\
 + \frac{3}{4} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{3} \\
 + \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{2}{3} \\
 + \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{3} \\
 + \frac{5}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{2}{3} \\
 + \frac{5}{6} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 2. \quad \frac{1}{2} \\
 - \frac{1}{4} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{3}{4} \\
 - \frac{1}{2} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{3} \\
 - \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{2}{3} \\
 - \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{5}{6} \\
 - \frac{1}{3} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{5}{6} \\
 - \frac{2}{3} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 3. \quad \frac{1}{2} \\
 + \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{2} \\
 + \frac{3}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{2} \\
 + \frac{5}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{2} \\
 + \frac{7}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{4} \\
 + \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{3}{4} \\
 + \frac{3}{6} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 4. \quad \frac{1}{2} \\
 - \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{2} \\
 - \frac{3}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{5}{6} \\
 - \frac{1}{2} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{7}{6} \\
 - \frac{1}{2} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{4} \\
 - \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{3}{4} \\
 - \frac{3}{6} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 5. \quad \frac{1}{5} \\
 + \frac{1}{10} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{2}{5} \\
 + \frac{3}{10} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{3}{5} \\
 + \frac{7}{10} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{4}{5} \\
 + \frac{9}{10} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{2} \\
 + \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{2} \\
 + \frac{5}{6} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 6. \quad \frac{1}{5} \\
 - \frac{1}{10} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{2}{5} \\
 - \frac{3}{10} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{7}{10} \\
 - \frac{3}{5} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{9}{10} \\
 - \frac{4}{5} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{1}{2} \\
 - \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 \frac{5}{6} \\
 - \frac{1}{2} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 7. \quad 2\frac{1}{2} \\
 + \frac{1}{4} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 2\frac{1}{3} \\
 + \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 1\frac{2}{3} \\
 + \frac{5}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 2\frac{1}{2} \\
 + \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 2\frac{1}{2} \\
 + \frac{5}{6} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 8. \quad 2\frac{1}{2} \\
 - \frac{1}{4} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 2\frac{1}{3} \\
 - \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 1\frac{2}{3} \\
 - \frac{5}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 2\frac{1}{2} \\
 - \frac{1}{6} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 2\frac{1}{2} \\
 - \frac{5}{6} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 9. \quad 2\frac{1}{5} \\
 + 2\frac{1}{10} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 1\frac{2}{5} \\
 + 1\frac{3}{10} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 1\frac{3}{5} \\
 + 1\frac{7}{10} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 1\frac{4}{5} \\
 + 1\frac{9}{10} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 2\frac{1}{5} \\
 + 2\frac{1}{6} \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 10. \quad 4\frac{3}{10} \\
 - 2\frac{1}{5} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 3\frac{7}{10} \\
 - 1\frac{2}{5} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 3\frac{3}{10} \\
 - 1\frac{3}{5} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 3\frac{9}{10} \\
 - 1\frac{4}{5} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 4\frac{1}{2} \\
 - 2\frac{1}{6} \\
 \hline
 \end{array}$$

73. Written Exercises.

Add, writing answers only :

$$\begin{array}{r} 1. \quad 22\frac{1}{3} \\ 16\frac{2}{3} \\ \hline 19\frac{2}{3} \end{array}$$

$$\begin{array}{r} 2. \quad 15\frac{4}{7} \\ 33\frac{1}{7} \\ \hline 46\frac{5}{7} \end{array}$$

$$\begin{array}{r} 3. \quad 44\frac{5}{8} \\ 23\frac{5}{11} \\ \hline 16\frac{5}{8} \end{array}$$

$$\begin{array}{r} 4. \quad 10\frac{4}{9} \\ 12\frac{5}{9} \\ \hline 66\frac{5}{9} \end{array}$$

Find sums :

$$\begin{array}{r} 5. \quad 35\frac{3}{4} \\ 15\frac{7}{10} \\ 3\frac{9}{10} \\ \hline 7\frac{1}{2} \end{array}$$

$$\begin{array}{r} 6. \quad 94\frac{5}{8} \\ 37\frac{1}{2} \\ 15\frac{5}{7} \\ \hline 11\frac{9}{14} \end{array}$$

$$\begin{array}{r} 7. \quad 48\frac{3}{4} \\ 12\frac{4}{5} \\ 51\frac{5}{18} \\ \hline 16\frac{1}{2} \end{array}$$

$$\begin{array}{r} 8. \quad 10\frac{5}{8} \\ 26\frac{9}{11} \\ 31\frac{7}{12} \\ \hline 2\frac{1}{2} \end{array}$$

$$\begin{array}{r} 9. \quad 8\frac{1}{2} \\ 12\frac{5}{13} \\ 15\frac{9}{26} \\ \hline 18\frac{1}{3} \end{array}$$

$$\begin{array}{r} 10. \quad 27\frac{1}{2} \\ 16\frac{8}{17} \\ 9\frac{1}{2} \\ \hline 12\frac{1}{8} \end{array}$$

$$\begin{array}{r} 11. \quad 4\frac{1}{2} \\ 5\frac{5}{17} \\ 10\frac{3}{4} \\ \hline 7\frac{1}{2} \end{array}$$

$$\begin{array}{r} 12. \quad 35\frac{1}{4} \\ 18\frac{1}{2} \\ 14\frac{3}{19} \\ \hline 20\frac{1}{8} \end{array}$$

74. Written Exercises.

Find the missing terms :

$$\begin{array}{r} 1. \quad 80 \\ - 21\frac{5}{8} \\ \hline ? \end{array}$$

$$\begin{array}{r} 4. \quad 67\frac{7}{10} \\ - 36\frac{3}{4} \\ \hline ? \end{array}$$

$$\begin{array}{r} 7. \quad 83\frac{1}{2} \\ - 21\frac{5}{17} \\ \hline ? \end{array}$$

$$\begin{array}{r} 10. \quad 342\frac{4}{15} \\ - 131\frac{5}{8} \\ \hline ? \end{array}$$

$$\begin{array}{r} 2. \quad 54\frac{4}{7} \\ - ? \\ \hline 26\frac{1}{3} \end{array}$$

$$\begin{array}{r} 5. \quad 94\frac{5}{14} \\ - 30\frac{1}{4} \\ \hline ? \end{array}$$

$$\begin{array}{r} 8. \quad 78\frac{3}{4} \\ - 16\frac{5}{22} \\ \hline ? \end{array}$$

$$\begin{array}{r} 11. \quad 254\frac{7}{8} \\ - 225\frac{7}{18} \\ \hline ? \end{array}$$

$$\begin{array}{r} 3. \quad 65 \\ - ? \\ \hline 32\frac{1}{4} \end{array}$$

$$\begin{array}{r} 6. \quad 167\frac{3}{10} \\ - 112\frac{1}{5} \\ \hline ? \end{array}$$

$$\begin{array}{r} 9. \quad 125 \\ - ? \\ \hline 33\frac{8}{9} \end{array}$$

$$\begin{array}{r} 12. \quad 94\frac{1}{2} \\ - 47\frac{7}{10} \\ \hline ? \end{array}$$

$$\begin{array}{r} 13. \quad 237\frac{7}{30} \\ - 124\frac{2}{3} \\ \hline ? \end{array}$$

$$\begin{array}{r} 14. \quad 165\frac{1}{4} \\ - 112\frac{5}{18} \\ \hline ? \end{array}$$

$$\begin{array}{r} 15. \quad 100 \\ - 79\frac{7}{15} \\ \hline ? \end{array}$$

$$\begin{array}{r} 16. \quad 112\frac{3}{16} \\ - 74\frac{1}{4} \\ \hline ? \end{array}$$

$$17. \quad 16\frac{1}{7} + 12\frac{1}{2} - 5\frac{5}{7} = ?$$

$$18. \quad 22\frac{1}{3} + 7\frac{1}{2} - 8\frac{2}{3} = ?$$

MULTIPLICATION OF FRACTIONS

75. Oral Exercises.

Multiply at sight:

$$3\frac{1}{2} \times 2$$

$$2\frac{1}{3} \times 5$$

$$2\frac{2}{3} \times 6$$

$$2\frac{3}{4} \times 8$$

$$6\frac{1}{5} \times 10$$

$$3\frac{1}{3} \times 9$$

$$6\frac{2}{3} \times 2$$

$$1\frac{1}{7} \times 3$$

$$1\frac{3}{8} \times 5$$

$$1\frac{5}{8} \times 2$$

$$1\frac{7}{10} \times 2$$

$$2\frac{1}{5} \times 15$$

76. Written Exercises.

Find products:

$$1. \quad 17\frac{4}{7} \times 14$$

$$4. \quad 19\frac{5}{8} \times 3$$

$$7. \quad 6\frac{4}{5} \times 25$$

$$2. \quad 8\frac{2}{3} \times 27$$

$$5. \quad 23\frac{7}{9} \times 5$$

$$8. \quad 29\frac{1}{3} \times 27$$

$$3. \quad 12\frac{3}{10} \times 20$$

$$6. \quad 4\frac{3}{11} \times 77$$

$$9. \quad 30\frac{5}{8} \times 4\frac{1}{2}$$

$$10. \quad \frac{15}{32} \times \frac{2}{11} \times \frac{4}{5}$$

$$14. \quad 17\frac{1}{7} \times 2\frac{1}{10} \times \frac{2}{3}$$

$$11. \quad \frac{36}{7} \times \frac{5}{8} \times \frac{1}{6}$$

$$15. \quad \frac{5}{38} \times 4\frac{3}{4} \times 10\frac{2}{3}$$

$$12. \quad \frac{10}{11} \times \frac{4}{7} \times \frac{49}{30}$$

$$16. \quad 16\frac{1}{5} \times 7\frac{1}{7} \times 2\frac{2}{7}$$

$$13. \quad 25\frac{5}{8} \times 6\frac{2}{3} \times \frac{3}{4}$$

$$17. \quad 6\frac{7}{8} \times 3\frac{1}{3} \times 6\frac{2}{7}$$

BILLS

77. Written Exercises.

1. William Walker of 6 St. Luke's Place, Dealer in Wood, Coal, Hay, etc., on June 15, 1917, sent to John White of 452 West 14 St. a bill for 8 T. coal @ \$6.50, 12 bu. corn @ \$.85, and 2 T. hay @ \$21. The goods were purchased on June 7, 1917. Make out the bill and receipt it as though you were a clerk in William Walker's office.

2. You sell to a classmate the following: 6 doz. buttons @ \$.18; 5 yd. ribbon @ \$.35; 12 yd. muslin @ \$.11; 2 blankets @ \$.5. Make out the bill and receipt it.

3. You buy the following from some dealer whose name and address you know: 3 bu. potatoes @ \$1.15, $1\frac{1}{4}$ pk. apples @ \$.40, $1\frac{1}{4}$ gal. vinegar @ \$.32, 6 lb. rice @ \$.08. Make out the bill. A clerk receipts it.

4. Make out a bill in proper form for the following items. Supply dates and names. 2 doz. plates @ \$3.60 per dozen; $\frac{1}{2}$ doz. tumblers @ \$2.40 per dozen; 2 pitchers @ \$.85; 1 doz. cups and saucers @ \$3 per dozen. Receipt the bill.

FINDING WHAT FRACTION ONE NUMBER IS OF ANOTHER

78. Oral Exercises.

1. What part of a dollar is 50¢? 25¢? 10¢? 75¢?

2. What part of 11 is 5?

1 is $\frac{1}{11}$ of 11. 5 is 5 times $\frac{1}{11}$, or $\frac{5}{11}$.

3. What part of 11 is 3? 8? 10?

4. What part of a dozen is 6? 3? 1? 2? 5? 10?

5. A boy had 35 cents and spent 7 cents. What part of his money did he spend?

MEASUREMENT

MEASURES OF LENGTH

12 inches (in.) = 1 foot (ft.)

3 feet = 1 yard (yd.)

$5\frac{1}{2}$ yards = 1 rod (rd.)

$16\frac{1}{2}$ feet = 1 rod

320 rods = 1 mile (mi.)

1,760 yards = 1 mile

5,280 feet = 1 mile

79. Oral Exercises.

1. What part of a foot is 1 inch? 3 inches? 6 inches? 9 inches? 11 inches?
2. What part of a yard is 1 ft.? 2 ft.?
3. How many inches are there in 1 yd.?
4. What part of a yard is 6 inches? 9 inches? 12 inches? 18 inches? 24 inches?
5. A man is 70 inches in height. Tell his height in feet and inches.
6. Bessie is 3 ft. 5 in. in height. Her father is 5 ft. 11 in. in height. How much taller than Bessie is her father?
7. How many yards and feet are there in 14 ft.?
8. A dressmaker cut 18 yd. of ribbon from a roll of 27 yd. What part of the roll did she cut off?
9. Recite from memory the table of length.

80. Written Exercises.

1. What part of a mile is 1 furlong? (A furlong = 40 rd.)
2. Find the perimeter of a rectangular garden plot $21\frac{3}{8}$ yd. long and $17\frac{3}{4}$ yd. wide.
3. In a mile race, one of the runners stopped after going $\frac{5}{8}$ of the distance. How many yards from the finishing line was he when he stopped?
4. A passenger travels 440 ft. every time he walks around the deck of an ocean steamer. How many times must he walk around the deck to complete a mile?
5. A balloon reached a height of 7,920 ft. How many miles high did it go?

6. How much farther do the runners in a 5-mile race go than the runners in a 220-yard race?

7. The record for running 880 yd. is 1 minute $52\frac{1}{2}$ seconds. What part of a mile is 880 yd.?

8. Maxie Long ran 440 yd. in 47 seconds. What part of a mile is 440 yd.?

9. What part of a mile is 220 yd.? 32 rd.?

10. The salesman measured off 1 yd. 18 in. of cloth. Mary thought that it would not be enough and asked for $1\frac{3}{4}$ yd. How much larger was the second measurement than the first?

11. To $\frac{1}{3}$ of a yard add $\frac{1}{3}$ of a yard and give the answer in feet and inches.

12. John is $5\frac{5}{8}$ feet in height. His sister is 4 inches shorter. How tall is his sister?

13. From a stick 1 yd. 2 in. long, I cut off a piece 15 in. long. How many inches were left?

MEASURES OF WEIGHT

16 ounces (oz.)	= 1 pound (lb.)
100 pounds	= 1 hundredweight (cwt.)
2,000 pounds	= 1 ton (T.)
20 hundredweight	= 1 ton

81. Oral Exercises.

1. What part of a pound is 4 oz.?
2. What part of a ton is 1,000 lb.?
3. How many pounds are there in $\frac{1}{2}$ of a ton?
4. How many ounces in $\frac{3}{4}$ of a pound?
5. How many pounds and ounces are there in 35 oz.?
6. How many tons in 6,000 lb.?

7. Change 2 lb. 9 oz. to ounces.
8. Find the cost of $4\frac{1}{2}$ lb. of butter at \$.40 per pound.
9. A mother divided 2 lb. of candy equally among 5 children. What part of a pound did each child receive?
10. A grocer bought pepper for \$.50 per pound and sold it for \$.05 per ounce. How much did he gain on each pound?
11. A teacher bought 8 lb. of candy for her pupils and put it into boxes holding 4 oz. each. How many boxes did she fill?
12. At the rate of 40 cents a pound, how much will 12 ounces of spice cost?
13. Recite from memory the table of weight.

82. Written Exercises.

1. What part of a ton is 750 lb.?
2. Change 6,500 lb. to tons.
3. How many pounds are there in $\frac{7}{8}$ of a ton?
4. The White family buys coal by the ton, paying \$6.50 per ton. The Clarke family buys coal by 50-pound bags, paying 25 cents per bag. How much more per ton does the Clarke family pay for coal than the White family?
5. Mr. Madden burned $8\frac{1}{2}$ tons of coal every month for 4 months. During the remainder of the year he burned $1\frac{1}{2}$ tons per month. At \$6.50 per ton, how much did he pay for coal during the year?
6. A butcher uses 3 cwt. of ice every day. At the rate of \$40 per ton, how much will he pay for ice for 30 days?
7. Find the cost of 84 tons of hay at $\$15\frac{1}{2}$ per ton.
8. How many pounds of tea at 48¢ per pound must be given in exchange for 30 doz. eggs at 24¢ per dozen?

DRY MEASURE

 $2 \text{ pints (pt.)} = 1 \text{ quart (qt.)}$ $8 \text{ quarts} = 1 \text{ peck (pk.)}$ $4 \text{ pecks} = 1 \text{ bushel (bu.)}$ **83. Oral Exercises.**

1. Name 5 articles that are sold by dry measure.
2. How many quarts are there in one bushel?
3. How many pints are there in one bushel?
4. What part of a bushel is 4 qt.?
5. How many pints in $\frac{1}{4}$ of a peck?
6. Change 19 pt. to quarts and pints.
7. Change 27 qt. to pecks and quarts.
8. Change 19 pk. to bushels and pecks.
9. What part of a bushel is 1 pt.?
10. At the rate of 20 cents a half peck, how much will a bushel of potatoes cost?
11. Recite from memory the table of dry measure.

84. Written Exercises.

1. A peddler sold 2 bu. of chestnuts at 5 cents per pint. How much did he receive for his chestnuts?
2. A grocer sold a barrel of apples at 8 cents per quart. If there were $2\frac{1}{2}$ bu. in the barrel, how much did he receive for the apples?
3. If I buy potatoes at \$1.40 per bushel, for how much per quart must I sell them to gain \$1.16?
4. At 15¢ a quart, what will one half bushel of apples cost?
5. When potatoes are 10¢ a quart and \$2.78 a bushel, how much do I save per bushel, if I buy by the bushel instead of by the quart?

LIQUID MEASURE

4 gills (gi.) = 1 pint (pt.)

2 pints = 1 quart (qt.)

4 quarts = 1 gallon (gal.)

85. Oral Exercises.

1. How many pints are there in a gallon?
2. 3 pints is what part of a gallon?
3. How much will a gallon of ice cream cost at 20 cents per pint?
4. Name 5 articles that are sold by liquid measure.
5. How many gallons and quarts in 11 quarts?
6. At 15 cents a half pint, how much will 2 quarts of pure cream cost?
7. When milk costs 32 cents a gallon, how much will a quart and a pint cost?
8. How many pints in $3\frac{1}{2}$ gallons?
9. If I can put 2 gal. 1 qt. into one jar, how much can I put into 4 jars of this size?
10. Recite from memory the table of liquid measure.

MEASURES OF TIME

60 seconds (sec.) = 1 minute (min.)

60 minutes = 1 hour (hr.)

24 hours = 1 day (da.)

7 days = 1 week (wk.)

365 days = 1 common year (yr.)

366 days = 1 leap year

12 months (mo.) = 1 year

Thirty days hath September,
April, June, and November.
All the rest have thirty-one,
Except the second month alone,
To which we twenty-eight assign
Till leap year gives it twenty-nine.

86. Oral Exercises.

1. What part of a minute is 20 sec.? 40 sec.? 15 sec.?
2. What part of an hour is 30 min.? 12 min.? 45 min.?
3. A man works 8 hours a day. What part of a day does he work?
4. Mary Swartz went to work 20 days in September. What part of the month did she work?
5. 36 hours make how many days?
6. George Washington was born in 1732 and died in 1799. How old was he at the time of his death?
7. A man went to bed at half past ten o'clock and arose at seven o'clock. How many hours was he in bed?
8. Find out when the last leap year came.
9. Name the months that have 30 days.
10. Recite from memory the table of time.

87. Written Exercises.

1. Charles Stone attended school 190 days last year. What part of the year did he attend school?
2. He spent $\frac{1}{3}$ of the year in the country. How many weeks and days did he spend in the country?
3. Mr. Simpson left New York for a trip through the West on January 1, 1917. He returned 100 days later. What was the date of his return?

4. A watch lost 15 sec. a day. How much time did it lose during March and April?

5. 18 days is what part of October, November, and December taken together?

6. During the month of March, Uncle John went to bed every night at half past nine o'clock and rose at six o'clock. How many hours did he spend in bed during the month of March?

7. At 1 o'clock in the afternoon, a train left New York for Buffalo, 438 miles distant. Going at the rate of 45 miles per hour, at what hour did it arrive at Buffalo?

8. A train due at 8:10 arrived at 9 o'clock. What part of an hour was the train behind time?

9. A train was due in Montreal at 8:15 in the morning. On account of a snowstorm, it was $3\frac{3}{4}$ hours late. At what time did it reach Montreal?

10. A train goes at the rate of $\frac{3}{4}$ mile a minute. How far will it go in an hour?

11. At the rate of 42 miles an hour, how far will a train go in 15 minutes?

12. A woman earns 24 cents an hour doing housework. If she works 8 hours and 20 minutes in a day, how much will she earn?

13. Jennie studies 2 hr. and 20 min. every day. How many hours will she study in 5 days?

SQUARE MEASURE

144 square inches (sq. in.) = 1 square foot (sq. ft.)

9 square feet = 1 square yard (sq. yd.)

$30\frac{1}{4}$ square yards = 1 square rod (sq. rd.)

160 square rods = 1 acre (A.)

640 acres = 1 square mile (sq. mi.)

88. Oral Exercises.

1. What part of a square foot is 12 sq. in.?
2. What part of a square yard is 3 sq. ft.?
3. Find the number of square inches in $\frac{5}{12}$ of a square foot. In $\frac{1}{3}$ of a square foot. In $\frac{1}{8}$ of a square foot. In $\frac{7}{12}$ of a square foot.
4. Find the number of acres in $\frac{1}{2}$ sq. mi. In $\frac{1}{10}$ sq. mi.
5. How many square yards are there in 84 sq. ft.?
6. How many square yards and square feet are there in 31 sq. ft.?
7. How many square feet in a piece of carpet 5 yd. long and 1 yd. wide?
8. Recite from memory the table of square measure.

89. Written Exercises.

1. What part of a square foot is 72 sq. in.? 36 sq. in.? 18 sq. in.? 108 sq. in.?
2. What part of an acre is 20 sq. rd.?
3. What part of a square mile is 160 A.? 80 A.?
4. How many square feet are there in 1,152 sq. in.?
5. How many acres are there in 2,400 sq. rd.?
6. How many acres and square rods are there in 1,400 square rods?
7. How many acres in a rectangular field 120 rods long and 128 rods wide?
8. How many square feet in the surface of a table $5\frac{1}{2}$ ft. long and $3\frac{1}{3}$ ft. wide?
9. Mr. Morton has built a house 25 ft. wide and 50 ft. deep on his lot, which is 25 ft. front and 100 ft. deep. The remainder of the lot is a garden. How many square feet of garden has he?

10. At 80 cents a square foot, how much will it cost to pave a sidewalk 45 ft. long and 14 ft. wide?

11. How many square yards of surface are there in a hallway 30 ft. long and $4\frac{1}{2}$ ft. wide?

12. If a quart of paint covers a surface of 12 sq. ft., how many quarts of paint will be needed to cover the floor of a room 8 ft. by 12 ft.?

13. How many square inches are there in a piece of silk 3 yd. long and $\frac{3}{4}$ yd. wide?

THE SEQUENCE OF SIGNS; PARENTHESES

90. Oral Exercises.

To avoid confusion in certain kinds of examples, a parenthesis is used. Operations within parentheses are to be done first.

1. Give answers at sight:

$$(28 + 20) \div 4$$

$$(75 - 25) \div 5$$

$$(17 + 4) \times 3$$

$$(25 - 10) \times 4$$

$$(100 - 12) \div 8$$

$$(110 - 11) \div 11$$

$$(160 - 16) \div 12$$

$$(80 + 16) \div 8$$

$$(10 + 9) \times 3$$

$$(12 + 13) \times 5$$

$$(30 - 15) \times 5$$

$$(21 - 9) \times 6$$

When no parentheses appear in an example, *perform the multiplication and division before the addition and subtraction.*

Give answers at sight:

$$10 + 6 \div 2$$

$$14 - 4 \times 3$$

$$15 - 3 \div 3$$

$$5 \times 3 + 4 \times 2$$

$$12 + 9 \times 3$$

$$2 \times 5 + 3 \times 3$$

When only multiplication and division signs are used, perform the operations from left to right in order of the signs.

$$24 \div 6 \times 5 \div 2 = 10$$

2. Give answers :

$$50 \times 2 \div 10 \times 11$$

$$12 \times 7 \div 4 \times 2$$

$$9 \times 11 \div 3 \times 2$$

$$54 \div 6 \times 7 \div 3$$

$$96 \div 8 \times 5 \div 12$$

$$48 \div 8 \times 7 \div 6$$

$$11 \times 10 \div 5 \times 3$$

$$144 \div 12 \times 6 \div 2$$

$$27 - 10 + 6 - 9 = 14$$

Where only addition and subtraction signs are used, perform the operations from left to right in the order of signs, or group the addition together and the subtraction together.

$$27 - 10 + 6 - 9 = 27 + 6 - 10 - 9 = 14$$

3. Give answers :

$$56 - 10 - 9 + 4 + 10$$

$$33 + 8 + 10 - 9 + 12$$

$$72 + 9 - 11 + 5 - 25$$

$$19 + 11 - 20 + 15 + 11$$

INDICATING OPERATIONS**91. Written Exercises.**

1. Jack had 38 marbles and bought 20 more. He divided them equally between his two little brothers. How many did each brother receive?

$$(38 + 20) \div 2 =$$

2. On the first of January Mrs. Judd had \$2,750 in the bank. During the month she drew out at different times \$75, \$118, and \$93. How much did she have left in the bank at the end of the month?

$$2,750 - (75 + 118 + 93) =$$

3. A farmer sold 49 sheep at \$4 each and 14 cows at \$45 each. How much did he receive from both sales?

$$(4 \times 49) + (14 \times 45) =$$

4. Charles Hart saved \$5. After buying 4 neckties at \$.35 each and 3 pairs of gloves at \$.95 each for Christmas presents, how much did he have left?

$$5.00 - (4 \times .35) - (3 \times .95) =$$

5. It takes 8 men 9 days to do a piece of work. How long will it take 24 men to do it?

$$\frac{8 \times 9}{24} =$$

Indicate the operations required for the solution of the following problems. Then find answers.

6. A newsboy every day earned 25¢ selling morning papers and 20¢ selling evening papers. How much did he earn in 6 days?

7. A workman earned \$3 for a full day's work. One week of 6 working days he lost \$.50 on 3 different days by reporting late for work. How much did he earn that week?

8. Mr. Judson had \$686. Of this he paid \$264 for a horse for himself and with the remainder he bought ponies for his two sons, paying the same price for each pony. How much did he pay for each pony?

9. How much did Mrs. Strong pay for a chicken weighing 3 lb. at \$.26 a pound and a turkey weighing 18 lb. at \$.28 a pound?

10. Mrs. Black bought 6 yd. of velvet at \$2.50 a yard and 9 yd. of braid at \$.45 a yard. How much change did she receive from a twenty-dollar bill?

11. A coal dealer had 963 tons of coal on hand. He sold to different persons $42\frac{1}{2}$ tons, 56 tons, $39\frac{1}{2}$ tons, and 3 tons. How many tons did he have left?

12. A steamship made the trip from New York to Bremen, a distance of 3,558 miles, in 8 days. During the first seven days, it went these distances: 425 mi., 495 mi., 461 mi., 450 mi., 470 mi., 482 mi., and 458 mi. How far did it go the eighth day?

13. One man working 8 hours a day can do a piece of work in 24 days. At the same rate, how long will it take 12 men working 6 hours a day to do the work?

14. A steamboat goes 224 miles in 16 hours. How far will it go in 48 hours at the same rate?

15. Mr. Foster's profits last year on 15 acres of land were \$300. At this rate, what were his profits on his whole farm of 375 acres?

16. If it costs me \$1.65 to travel 55 miles on a railroad, how much will it cost me to travel 210 miles on the railroad at the same rate?

92. Written Problems.

1. Fire destroyed 175 yd. of a tailor's stock of 425 yd. of cloth. What part of his stock was destroyed by fire?

2. A wholesale flour merchant sold 545 barrels of flour. He had 155 barrels left. What part of his stock remained unsold?

3. A farmer planted 225 acres of his farm of 350 acres. The remainder he kept for grazing. What part of his farm did he keep for grazing?

4. A man owed \$7,500. He paid \$250 each month for 10 months. At the end of the 10 months, what part of his debt remained unpaid?

5. A steamer traveled 415 miles on one day and 385 miles on the following day. What part of its journey of 3,000 miles did the steamer go in these two days?

6. A merchant had \$320 worth of gloves in his store. \$240 worth of these gloves had been bought in Paris. What part of his stock had been bought in Paris?

7. A builder received \$4,410 in one week. His expenses for the week were \$3,150. What part of the money that he received did he pay out?

8. A merchant bought 175 yd. of ribbon at \$.80 a yard. What part of \$630 did he spend?

9. The population of Spain is 19,500,000. Of these, 4,000,000 are farmers. What part of the population is engaged in farming?

93. Written Problems.

LAUNDRY LIST

Shirts	10 cents
Collars	2 cents
Cuffs	2 cents
Shirtwaists	20 cents
Handkerchiefs	2 for 5 cents
Starched pieces	60 cents a dozen
Flat work	40 cents a dozen

1. Find the total cost of laundering the following :

7 shirts	3 shirtwaists
7 collars	$\frac{1}{2}$ doz. starched pieces
14 cuffs	$1\frac{1}{2}$ doz. flat work
20 handkerchiefs	

AT THE MARKET

Chicken	\$.28 a pound
Turkey	.32 a pound
Beef	.30 a pound
Potatoes	.12 a quart
Cranberries	.10 a quart
Beets (3 bunches)	.10
Beans	.20 a quart
Apples	.10 a quart
Oranges, 6 for	.25
Rice	.10 a pound
Butter	.40 a pound
Eggs	.50 a dozen

2. Mrs. White bought a chicken weighing $5\frac{1}{2}$ lb., 2 qt. of potatoes, 1 qt. of cranberries, $1\frac{1}{2}$ qt. of beans, 1 qt. of apples, 1 doz. oranges, $\frac{1}{2}$ lb. of butter, and $\frac{1}{2}$ doz. eggs. What was the amount of her bill?

3. Mrs. Dunn bought a turkey weighing $10\frac{1}{4}$ lb., 2 qt. of potatoes, 1 qt. of cranberries, 6 bunches of beets, 1 qt. of apples, $1\frac{1}{2}$ lb. of rice, 1 lb. of butter, and 18 eggs. What was the amount of her bill?

4. Mrs. George bought a roast of beef weighing $8\frac{1}{2}$ lb., $1\frac{1}{2}$ doz. eggs, $\frac{1}{2}$ lb. of rice, 18 oranges, and $2\frac{1}{4}$ lb. of butter. How much change did she receive from a ten-dollar bill?

ALICE GRANT'S TROUSSEAU

Alice Grant is to be married and wishes to buy the following dresses:

- 1 white satin dress
- 1 pink evening dress
- 1 green traveling dress
- 1 blue serge dress

Find the cost of the material for each dress.

5. The white satin dress requires $8\frac{7}{8}$ yd. of satin at \$2.64 a yard; $13\frac{3}{4}$ yd. of chiffon at \$1.80 a yard; $2\frac{1}{4}$ yd. of lace for the veil at \$8.00 a yard; $2\frac{1}{2}$ yd. of white velvet for the train at $\$4\frac{1}{2}$ a yard.

6. The pink evening dress requires $5\frac{1}{8}$ yd. of silk at \$2.80 per yard; $3\frac{7}{8}$ yd. of satin at \$3.44 per yard; $2\frac{1}{2}$ yd. of trimming at \$.98 per yard.

7. The green dress requires $4\frac{3}{8}$ yd. of broadcloth at \$1.92 per yard; 4 yd. black fur for trimming at \$1.85 per yard.

8. The blue serge requires $4\frac{1}{2}$ yd. of goods at \$1.60 per yard.

9. How much must Alice pay in all for the material for her dresses?

94. Written Problems.**PAINTING A FENCE**

1. A fence incloses a yard on three sides. The length of the fence on one side is 65 ft., the height 8 ft. How many square feet of fence are on this side of the yard? The length of the second side is 20 ft., the height 8 ft. What is the area of this side of the fence? The area of the third side is the same as that of the first side. How many square feet of surface are there in the three sides?

2. A gallon of prepared paint will cover 300 sq. ft. of surface. How many gallons will be needed to paint the outside of the fence?

3. The paint costs \$2.10 a gallon. What will be the cost of the paint required to paint the fence?

4. Two brushes each costing 45 cents are used. What will both paint and brushes cost?

5. The cost of painting fences is $1\frac{1}{2}$ times the cost of the paint. If the paint costs \$2.10 a gallon, what would be the cost of labor in painting this fence? What would be the cost of labor and material?

6. If a boy does the painting for his father and covers 320 sq. ft. of surface each day, how many days will he take to paint the entire fence?

7. If his father allows him 60 cents a day for his work, how much will he earn for painting the entire fence?

THE JANITOR

8. On a cold day a janitor found that, in order to keep his building properly heated, he must put 20 shovelfuls of coal on the fire ten times during the day. He weighed a shovelful of coal and found that it weighed 20 pounds. How many pounds of coal did he use?

9. There were 2 furnaces each requiring the amount stated in Ex. 8. How many pounds were used on both? How many tons were used on both fires that day?

10. The coal used was worth \$5.75 per ton. What was the cost of keeping both fires going that day?

11. The following day only $\frac{2}{3}$ as much coal was used. How many tons were used on that day? What was the value?

12. To heat water for use in the building 500 lb. of coal a week were found to be sufficient. What fraction of a ton was this?

13. At a cost of \$5.75 a ton, what would be the cost of heating water for one week?

THE WALKING CLUB

14. 30 girls in a public school formed a walking club. Between the first of May and the end of June they took 4 walks. On the first walk they went $4\frac{1}{2}$ miles; on the second, $3\frac{2}{3}$ miles; on the third, $3\frac{3}{10}$ miles; and on the fourth, $4\frac{1}{10}$ miles. How many miles did they walk in these two months?

15. The club color was blue. Each girl used $1\frac{3}{4}$ yd. of blue ribbon for her hair. The teacher bought the ribbon at \$.33 $\frac{1}{3}$ a yard. How much did the club spend for ribbon?

16. Every fifth girl carried a pennant. At 75 cents each, how much was spent for pennants?

FOURTH QUARTER

COUNTING

95. Oral Exercises.

1. Beginning with 5, count by 9's to 104.
2. Beginning with 6, count by 9's to 105.
3. Beginning with 7, count by 9's to 106.
4. Beginning with 9, count by 7's to 107.

ADDITION

96. Oral Exercises.

Give answers at sight :

$70 + 60 + 24$

$60 + 80 + 23$

$90 + 60 + 25$

$60 + 70 + 27$

$80 + 60 + 26$

$70 + 70 + 31$

$80 + 70 + 35$

$90 + 70 + 38$

$80 + 80 + 34$

$90 + 80 + 36$

$90 + 90 + 14$

$20 + 90 + 33$

97. Written Exercises.

1. 46,482

2. \$115,725.91

3. 2,174

49,538

76,261.27

8,346

45,442

159,719.35

3,603

37,390

24,785.76

4,252

24,256

184,375.45

1,495

67,845

37,484.76

6,631

53,206

29,493.35

2,001

15,784

143,152.14

6,429

71,935

22,035.63

762

72,519

31,256.20

1,862

Add:

4. Three dollars and ninety-four cents,
 Seven dollars and fifty-three cents,
 Two dollars,
 Six dollars and thirty-one cents,
 Two dollars and seventy-nine cents,
 Four dollars and forty-six cents,
 One dollar and seventy-five cents,
 Three dollars and forty-seven cents,
 Three dollars and fifty-seven cents,
 Nine dollars and sixty-one cents,
 Seven dollars and sixty-eight cents,
 Two dollars and sixty-seven cents.

5. Two hundred fifty-eight,	Six hundred eighty-eight,
Nine hundred three,	Four hundred fifty-seven,
Two hundred sixty-four,	Two hundred eighty-two,
Two hundred forty-nine,	Four hundred sixty-four,
Eight hundred twenty-eight,	One hundred five,
Three hundred forty-seven,	Four hundred sixty-seven.

6. \$ 67,854.07	7. 8,675,946	8. \$ 52,654.28
209,726.79	7,048,534	36,273.81
80,469.56	9,582,265	17,634.75
47,558.21	5,413,823	43,496.77
75,647.68	2,359,301	112,189.20
53,179.42	1,637,145	58,736.96
34,200.00	3,214,023	124,153.62
<u>122,214.43</u>	<u>4,526,522</u>	<u>278,261.05</u>

9. Nine dollars and thirty-five cents,
 Two dollars and ninety-three cents,
 Seven dollars and twenty-eight cents,

Eight dollars and thirty-nine cents,
 Four dollars and eighty-two cents,
 Five dollars and sixty-four cents,
 Six dollars and eighty-nine cents,
 Four dollars and thirty-six cents,
 One dollar and seven cents,
 Two dollars and ninety-eight cents,
 Two dollars and forty-six cents,
 Three dollars and sixty-three cents.

10. The distance from San Francisco to Hawaii is 2,097 miles. From Hawaii to Japan the distance is 3,403 miles. What is the combined distance from San Francisco to Japan?

11. The area of the various North Atlantic states is as follows:

Maine	33,040 square miles
New Hampshire	9,341 square miles
Vermont	9,564 square miles
Massachusetts	8,266 square miles
Rhode Island	1,248 square miles
Connecticut	4,965 square miles
New York	49,204 square miles
New Jersey	8,224 square miles
Pennsylvania	45,126 square miles

Find the total area of the North Atlantic states.

12. The population of the various South Atlantic states is as follows:

Delaware	202,322
Maryland	1,295,346
Virginia	2,061,612
North Carolina	2,206,287
South Carolina	1,515,400
Georgia	2,609,121
Florida	752,619

Find the total population of the South Atlantic states.

13. The population of the South Central states is as follows :

Kentucky	2,289,905
Texas	3,896,542
Tennessee	2,184,789
Arkansas	1,574,449
Mississippi	1,797,114
Alabama	2,138,093
Louisiana	1,656,388
Oklahoma	1,657,155

Find the total population of the South Central states.

14.	7,365,209	15. \$	933,082.65	16.	60,536,157
	20,736,472		1,216,829.90		176,743,294
	584,384		2,006,351.57		29,252,543
	5,072,153		790,532.21		57,164,305
	9,268,321		54,263.24		176,005,160
	<u>803,935</u>		<u>247,105.36</u>		<u>14,597,825</u>
17.	96,704,785	18. \$	565.76		
	3,967,972		970.34		
	659,480		804.90		
	728,469		72.09		
	492,128		658.76		
	894,847		367.60		
	3,665,753		400.97		
	<u>4,279,465</u>		<u>512.08</u>		

Add :

19. One hundred two thousand five hundred twenty-seven dollars and forty-one cents,

Four hundred sixty-eight thousand seven hundred sixty-six dollars and forty-three cents,

Two hundred twenty-four thousand three hundred ninety dollars and twenty-five cents,

One million one thousand three hundred four dollars and twenty-six cents,

Fifty-two thousand eight hundred forty-nine dollars and seventy-eight cents,

Six hundred thirty thousand sixty-five dollars and thirty-seven cents,

Nine hundred forty-seven thousand four hundred fifty-two dollars and thirty-one cents,

Two hundred seventy-five thousand six hundred thirty-seven dollars and fifty-five cents,

One million three thousand two hundred twenty-four dollars and sixty-four cents,

Eight hundred ninety-nine thousand one hundred one dollars and twenty-two cents.

20. \$1,548,796.00	21. 387,210	22. \$ 677,843.85
1,015,504.56	732,968	1,008,439.47
263,483.75	103,592	52,830.56
72,055.39	426,643	7,362.00
350,622.64	751,535	395.47
927,417.08	372,493	645.76
67.32	650,422	383.43
<u>134.19</u>	<u>833,396</u>	<u>394.36</u>

SUBTRACTION

98. Oral Exercises.

$36 + ? = 65$

$46 + ? = 85$

$38 + ? = 74$

$37 + ? = 98$

$48 + ? = 97$

$45 + ? = 94$

$29 + ? = 68$

$28 + ? = 44$

$46 + ? = 75$

$27 + ? = 86$

$44 + ? = 75$

$54 + ? = 87$

99. Oral Exercises.

1. I sold an article for 59¢ and thereby lost 9¢. Find the cost.
2. Selling price 67¢. Gain 9¢. Cost?
3. Selling price 83¢. Gain 12¢. Cost?
4. Selling price 49¢. Loss 11¢. Cost?
5. Selling price 38¢. Gain 14¢. Cost?
6. Selling price 95¢. Loss 16¢. Cost?
7. Selling price 37¢. Gain 8¢. Cost?
8. Selling price 82¢. Loss 7¢. Cost?
9. Selling price 79¢. Gain 12¢. Cost?
10. Selling price 41¢. Loss 12¢. Cost?
11. Selling price 49¢. Gain 11¢. Cost?
12. Selling price 58¢. Loss 9¢. Cost?

100. Written Exercises.

How many pupils can work the first 5 examples correctly in 3 minutes? Do not copy the first 3 examples. Place a piece of paper below the subtrahend and write only the figures of the remainder.

$$\begin{array}{r} 1. \quad \$67,963.85 \\ - 29,671.92 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad \$587,349.25 \\ - 192,156.70 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 864,237,118 \\ - 571,345,226 \\ \hline \end{array}$$

4. From seven hundred two million three hundred sixteen thousand four subtract five hundred one million two hundred twenty-two thousand one hundred three.

5. The minuend is four hundred ninety-five million two hundred seventeen thousand three hundred nine, and the subtrahend is one hundred seventy-six million three hundred six thousand one hundred ninety-one. What is the remainder?

6. 1,197,892 immigrants landed in this country in 1913. 326,700 immigrants landed in this country in 1915. How many more immigrants landed in this country in 1913 than in 1915?

7. North Carolina contains 52,426 sq. mi. South Carolina contains 30,989 sq. mi. How much larger than South Carolina is North Carolina?

8. The population of Georgia is 2,609,121. The population of Florida is 752,619. How much greater is the population of Georgia than the population of Florida?

9. Mt. McKinley is 20,464 feet high. Mt. Hood is 11,225 feet high. How much higher than Mt. Hood is Mt. McKinley?

Name and supply the missing terms:

10. ? - 256,309,457 178,407,568	11. ? - 362,567,912 443,632,124	12. 155,285,362 - ? 42,056,171
--	--	---

Find the missing numbers:

13. ? + 717,626 929,418	14. 691,282 + ? 694,176	15. ? + 235,318 463,437
--	--	--

MULTIPLICATION

101. Oral Exercises.

1. Multiply each of the following numbers by 10:

56 71 89 112 245 360 949 1,000

2. Give answers:

8 × 300	9 × 500	12 × 600	7 × 800
6 × 900	9 × 700	11 × 400	8 × 600

3. Supply the missing numbers :

$?\div 11 = 12$

$?\div 5 = 25$

$?\div 6 = 18$

$?\div 45 = 3$

$?\div 21 = 8$

$?\div 15 = 7$

$?\div 9 = 22$

$?\div 6 = 14$

$?\div 8 = 15$

$?\div 11 = 11$

$?\div 49 = 2$

$?\div 5 = 65$

$?\div 7 = 105$

$?\div 9 = 207$

$?\div 8 = 112$

102. Written Exercises.

1. $\$39,828.75 \times 37$

3. $8,287,961 \times 28$

2. $5,892,763 \times 49$

4. $\$67,375 \times 56$

Multiply :

5. $\begin{array}{r} 382,634 \\ \times 807 \\ \hline \end{array}$

8. $\begin{array}{r} \$462.73 \\ \times 280 \\ \hline \end{array}$

11. $\begin{array}{r} 9,083 \\ \times 3,050 \\ \hline \end{array}$

14. $\begin{array}{r} \$406.43 \\ \times 3008 \\ \hline \end{array}$

6. $\begin{array}{r} \$8,493.07 \\ \times 906 \\ \hline \end{array}$

9. $\begin{array}{r} 9,667 \\ \times 8,540 \\ \hline \end{array}$

12. $\begin{array}{r} \$817.94 \\ \times 2090 \\ \hline \end{array}$

15. $\begin{array}{r} 85,473 \\ \times 500 \\ \hline \end{array}$

7. $\begin{array}{r} 97,531 \\ \times 340 \\ \hline \end{array}$

10. $\begin{array}{r} \$576.23 \\ \times 16760 \\ \hline \end{array}$

13. $\begin{array}{r} 5,878 \\ \times 5,007 \\ \hline \end{array}$

16. $\begin{array}{r} \$754.69 \\ \times 5000 \\ \hline \end{array}$

17. $\begin{array}{r} 8,043 \\ \times 7,867 \\ \hline \end{array}$

18. $\begin{array}{r} \$2,385.20 \\ \times 978 \\ \hline \end{array}$

DIVISION**103. Oral Exercises.**

$121 \div ? = 11$

$84 \div ? = 7$

$60 \div ? = 12$

$72 \div ? = 9$

$108 \div ? = 12$

$63 \div ? = 7$

$56 \div ? = 8$

$64 \div ? = 8$

$54 \div ? = 9$

$132 \div ? = 11$

$96 \div ? = 12$

$144 \div ? = 12$

104. Written Exercises.

- | | |
|-----------------------------|---------------------------------|
| 1. $7,526,434 \div 6$ | 11. $196,879,459 \div 77$ |
| 2. $\$987,525.44 \div 8$ | 12. $\$1,896,732.72 \div 584$ |
| 3. $75,433,641 \div 7$ | 13. $199,894,767 \div 99$ |
| 4. $\$36,437.49 \div 9$ | 14. $\$1,998,785.88 \div 476$ |
| 5. $334,568,988 \div 8$ | 15. $499,867,544 \div 896$ |
| 6. $\$542,529.81 \div 9$ | 16. $456,726,346 \div 2,246$ |
| 7. $97,789,693 \div 83$ | 17. $389,659,976 \div 968$ |
| 8. $\$857,837.95 \div 433$ | 18. $\$243,646,494 \div 21,322$ |
| 9. $99,897,456 \div 92$ | 19. $6,452,902 \div 5,242$ |
| 10. $\$978,656.04 \div 522$ | 20. $7,094,628 \div 4,374$ |

REDUCTION OF FRACTIONS**105. Oral Exercises.**

1. Reduce at sight to lowest terms:

$\frac{12}{24}$	$\frac{12}{22}$	$\frac{20}{28}$	$\frac{22}{30}$	$\frac{24}{30}$	$\frac{8}{32}$
$\frac{16}{32}$	$\frac{18}{36}$	$\frac{26}{38}$	$\frac{14}{40}$	$\frac{28}{42}$	$\frac{34}{46}$
$\frac{16}{48}$	$\frac{40}{50}$	$\frac{14}{56}$	$\frac{9}{54}$	$\frac{12}{60}$	$\frac{16}{64}$

2. Change to forty-ninths:
- $\frac{1}{7}$
- ,
- $\frac{2}{7}$
- ,
- $\frac{5}{7}$
- ,
- $\frac{6}{7}$
- ,
- $\frac{7}{7}$
- .

3. Change to fifty-sixths:

$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{7}$	$\frac{1}{8}$	$\frac{1}{14}$	$\frac{1}{28}$
$\frac{2}{7}$	$\frac{7}{8}$	$\frac{5}{14}$	$\frac{9}{28}$	$\frac{15}{28}$	$\frac{17}{28}$

4. Change to sixty-fourths:

$\frac{1}{4}$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	$\frac{1}{16}$	$\frac{7}{16}$
$\frac{1}{32}$	$\frac{3}{32}$	$\frac{7}{8}$	$\frac{5}{32}$	$\frac{15}{32}$	$\frac{33}{32}$

5. Change to seventy-seconds:

$$\begin{array}{cccccc} \frac{1}{2} & \frac{1}{3} & \frac{1}{4} & \frac{1}{6} & \frac{1}{8} & \frac{8}{8} \\ \hline \frac{1}{2} & \frac{3}{4} & \frac{5}{8} & \frac{1}{24} & \frac{5}{36} & \frac{7}{9} \end{array}$$

106. Written Exercises.

Reduce to lowest terms:

$$\begin{array}{lllll} 1. \frac{84}{192} & 4. \frac{32}{288} & 7. \frac{23}{249} & 10. \frac{141}{291} & 13. \frac{207}{819} \\ 2. \frac{65}{150} & 5. \frac{28}{80} & 8. \frac{111}{267} & 11. \frac{182}{657} & 14. \frac{90}{873} \\ 3. \frac{60}{400} & 6. \frac{35}{135} & 9. \frac{123}{273} & 12. \frac{171}{801} & 15. \frac{125}{585} \end{array}$$

CANCELLATION

107. Written Exercises.

1. 50 barrels of apples at \$3 per barrel will pay for how many yards of cloth at \$2 per yard?

2. 75 chickens at 60 cents each will pay for how many pounds of tea at 50 cents per pound?

3. A farmer gave 8 cows worth \$49 each in exchange for coal at \$7 per ton. How many tons of coal did he receive?

4. A woman exchanged 3 barrels of apples at \$2 a barrel for cloth at 15 cents a yard. How many yards did she receive?

ADDITION AND SUBTRACTION OF FRACTIONS

108. Oral Exercises.

Give answers at sight:

$$\begin{array}{llllll} 1. & \frac{1}{3} & \frac{1}{3} & \frac{1}{3} & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\ & + \frac{1}{9} & + \frac{5}{9} & + \frac{8}{9} & + \frac{1}{8} & + \frac{1}{3} & + \frac{2}{3} \\ \\ 2. & \frac{1}{3} & \frac{5}{9} & \frac{8}{9} & \frac{1}{2} & \frac{2}{3} & \frac{1}{2} \\ & - \frac{1}{9} & - \frac{1}{3} & - \frac{1}{3} & - \frac{1}{8} & - \frac{1}{2} & - \frac{1}{3} \end{array}$$

$$\begin{array}{r} 3. \quad 2\frac{1}{3} \quad 1\frac{5}{6} \quad 2\frac{1}{3} \quad 2\frac{1}{2} \quad 2\frac{1}{2} \quad 1\frac{2}{3} \\ + \frac{1}{9} \quad + \frac{1}{3} \quad + \frac{8}{9} \quad + \frac{1}{8} \quad + \frac{1}{3} \quad + \frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 2\frac{1}{3} \quad 1\frac{5}{6} \quad 2\frac{1}{3} \quad 2\frac{1}{2} \quad 2\frac{1}{2} \quad 1\frac{2}{3} \\ - \frac{1}{9} \quad - \frac{1}{3} \quad - \frac{8}{9} \quad - \frac{1}{8} \quad - \frac{1}{3} \quad - \frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 1\frac{2}{3} \quad 1\frac{5}{6} \quad 1\frac{8}{9} \quad 2\frac{1}{2} \quad 2\frac{1}{2} \quad 1\frac{2}{3} \\ + 2\frac{1}{9} \quad + 1\frac{2}{3} \quad + 2\frac{1}{3} \quad + 2\frac{1}{8} \quad + 2\frac{1}{3} \quad + 2\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 2\frac{1}{9} \quad 1\frac{2}{3} \quad 2\frac{1}{3} \quad 2\frac{1}{2} \quad 3\frac{1}{2} \quad 2\frac{1}{3} \\ - 1\frac{1}{3} \quad - 1\frac{5}{9} \quad - 1\frac{8}{9} \quad - 2\frac{1}{8} \quad - 1\frac{1}{3} \quad - 1\frac{2}{3} \\ \hline \end{array}$$

109. Written Exercises.

Add, writing answers only:

$$\begin{array}{llll} 1. \quad 9\frac{3}{8} & 2. \quad 25\frac{1}{8} & 3. \quad 42 & 4. \quad 62\frac{8}{11} \\ \quad 8\frac{5}{7} & \quad 30 & \quad 16\frac{1}{4} & \quad 34 \\ \quad 6 & \quad 22\frac{4}{5} & \quad 7\frac{5}{12} & \quad 16\frac{4}{5} \\ \quad 15\frac{2}{7} & \quad 12\frac{5}{8} & \quad 5\frac{3}{4} & \quad 18\frac{1}{5} \\ \hline \end{array}$$

Find sums:

$$\begin{array}{llll} 5. \quad 67\frac{1}{2} & 6. \quad 29\frac{1}{11} & 7. \quad 16\frac{2}{40} & 8. \quad 37\frac{2}{3} \\ \quad 42\frac{5}{23} & \quad 18\frac{1}{3} & \quad 5\frac{1}{2} & \quad 15\frac{1}{17} \\ \hline \end{array}$$

$$\begin{array}{llll} 9. \quad 63\frac{3}{8} & 10. \quad 37\frac{2}{5} & 11. \quad 81\frac{1}{2} & 12. \quad 14\frac{3}{7} \\ \quad 22\frac{5}{14} & \quad 45\frac{5}{11} & \quad 42\frac{2}{3} & \quad 10\frac{5}{8} \\ \quad 16\frac{4}{21} & \quad 12\frac{7}{22} & \quad 17\frac{5}{8} & \quad 3\frac{2}{3} \\ \quad 9\frac{1}{4} & \quad 7\frac{3}{10} & \quad 21\frac{5}{8} & \quad 22\frac{1}{2} \\ \hline \end{array}$$

110. Written Exercises.

Find the missing terms:

- | | | | |
|---|---|--|--|
| 1. $\begin{array}{r} 55\frac{5}{24} \\ - \quad ? \\ \hline 26\frac{1}{8} \end{array}$ | 5. $\begin{array}{r} 159\frac{9}{24} \\ - 87\frac{1}{8} \\ \hline ? \end{array}$ | 9. $\begin{array}{r} 172 \\ - 59\frac{9}{14} \\ \hline ? \end{array}$ | 13. $\begin{array}{r} 125\frac{1}{4} \\ - 87\frac{4}{21} \\ \hline ? \end{array}$ |
| 2. $\begin{array}{r} 82\frac{15}{8} \\ - 15\frac{5}{8} \\ \hline ? \end{array}$ | 6. $\begin{array}{r} 49\frac{12}{8} \\ - \quad ? \\ \hline 12\frac{1}{3} \end{array}$ | 10. $\begin{array}{r} 63 \\ - 18\frac{7}{8} \\ \hline ? \end{array}$ | 14. $\begin{array}{r} 70\frac{12}{4} \\ - 16\frac{1}{8} \\ \hline ? \end{array}$ |
| 3. $\begin{array}{r} 93\frac{12}{2} \\ - 31\frac{1}{2} \\ \hline ? \end{array}$ | 7. $\begin{array}{r} 263\frac{1}{8} \\ - 124\frac{5}{8} \\ \hline ? \end{array}$ | 11. $\begin{array}{r} 119\frac{7}{6} \\ - 72\frac{4}{3} \\ \hline ? \end{array}$ | 15. $\begin{array}{r} 361\frac{32}{2} \\ - 170\frac{1}{2} \\ \hline ? \end{array}$ |
| 4. $\begin{array}{r} 89 \\ - 47\frac{11}{8} \\ \hline ? \end{array}$ | 8. $\begin{array}{r} 59\frac{15}{4} \\ - 25\frac{1}{2} \\ \hline ? \end{array}$ | 12. $\begin{array}{r} 42\frac{5}{21} \\ - 14\frac{5}{8} \\ \hline ? \end{array}$ | 16. $\begin{array}{r} 39\frac{25}{81} \\ - 22\frac{2}{9} \\ \hline ? \end{array}$ |

$$17. 19\frac{1}{2} + 20\frac{1}{2} - 16\frac{1}{4} = ? \quad 18. 53\frac{7}{8} + 2\frac{1}{6} - 7\frac{5}{12} = ?$$

MULTIPLICATION OF FRACTIONS**111. Oral Exercises.**

1. Give answers at sight:

$\frac{3}{8} \times 36$	$\frac{5}{11} \times 99$	$\frac{7}{12} \times 84$	$\frac{2}{12} \times 120$
$\frac{5}{7} \times 49$	$54 \times \frac{5}{8}$	$72 \times \frac{5}{8}$	$27 \times \frac{7}{8}$
$96 \times \frac{3}{8}$	$121 \times \frac{7}{11}$	$132 \times \frac{5}{12}$	$\frac{5}{7} \times 56$

2. Give answers at sight:

$\frac{1}{2} \times \frac{2}{3} \times \frac{9}{10}$	$\frac{3}{4} \times \frac{1}{8} \times \frac{4}{5}$	$\frac{1}{8} \times \frac{16}{7} \times \frac{1}{2}$
$\frac{2}{3} \times \frac{12}{10} \times \frac{1}{2}$	$\frac{1}{8} \times \frac{12}{3} \times \frac{1}{4}$	$\frac{1}{8} \times \frac{3}{5} \times \frac{5}{8}$
$\frac{3}{7} \times \frac{14}{5}$	$\frac{5}{7} \times \frac{48}{10}$	$\frac{8}{9} \times \frac{27}{2}$
$5\frac{1}{2} \times \frac{6}{11}$	$7\frac{1}{3} \times \frac{1}{11}$	

112. Written Exercises.

- | | | | |
|--|---|---|--|
| 1. $\frac{3}{4} \times \frac{8}{21}$ | 6. $\frac{3}{7} \times \frac{17}{18}$ | 11. $\frac{9}{11} \times \frac{70}{81}$ | 16. $\frac{10}{11} \times \frac{8}{15}$ |
| 2. $\frac{2}{5} \times \frac{15}{16}$ | 7. $\frac{12}{20} \times \frac{40}{51}$ | 12. $\frac{7}{12} \times \frac{72}{91}$ | 17. $\frac{96}{121} \times \frac{11}{12}$ |
| 3. $\frac{3}{5} \times \frac{7}{8}$ | 8. $\frac{4}{7} \times \frac{21}{34}$ | 13. $\frac{5}{12} \times \frac{48}{55}$ | 18. $\frac{63}{200} \times \frac{50}{81}$ |
| 4. $\frac{5}{7} \times \frac{21}{25}$ | 9. $\frac{9}{10} \times \frac{120}{270}$ | 14. $\frac{7}{10} \times \frac{100}{147}$ | 19. $\frac{56}{99} \times \frac{33}{98}$ |
| 5. $\frac{4}{5} \times \frac{45}{48}$ | 10. $\frac{12}{22} \times \frac{88}{97}$ | 15. $\frac{5}{7} \times \frac{9}{12}$ | 20. $\frac{42}{80} \times \frac{160}{217}$ |
| 21. $\frac{8}{9} \times \frac{7}{12} \times \frac{63}{84}$ | 23. $\frac{8}{11} \times \frac{3}{7} \times \frac{33}{40}$ | 25. $\frac{9}{14} \times \frac{21}{22} \times \frac{2}{3}$ | |
| 22. $\frac{8}{15} \times \frac{9}{10} \times \frac{5}{18}$ | 24. $\frac{5}{12} \times \frac{7}{15} \times \frac{48}{49}$ | 26. $\frac{90}{71} \times \frac{3}{4} \times \frac{11}{15}$ | |
| 27. $30\frac{5}{8} \times 12\frac{3}{5}$ | 30. $13\frac{1}{5} \times 9\frac{3}{8}$ | 33. $40\frac{5}{8} \times 30\frac{3}{5}$ | |
| 28. $35\frac{7}{8} \times 14\frac{2}{7}$ | 31. $20\frac{5}{9} \times 8\frac{1}{10}$ | 34. $14\frac{7}{10} \times 21\frac{3}{7}$ | |
| 29. $18\frac{3}{8} \times 24\frac{3}{4}$ | 32. $12\frac{1}{4} \times 20\frac{2}{7}$ | 35. $5\frac{5}{8} \times 9\frac{2}{7} \times 24\frac{3}{8}$ | |

DIVIDING A FRACTION BY AN INTEGER**113. Oral Exercises.**

1. Divide 4 dollars by 2. Divide 4 apples by 2.

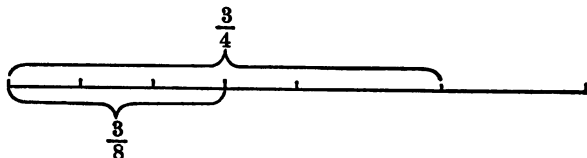
Divide 4 sevenths by 2. $\frac{4}{7} \div 2 = ?$

2. Divide 6 sevenths by 3. $\frac{6}{7} \div 3 = ?$

Dividing the numerator of a fraction divides the fraction.

3. Give answers:

$\frac{8}{9} \div 4$	$\frac{4}{7} \div 2$	$\frac{5}{8} \div 5$	$\frac{7}{10} \div 7$
$\frac{10}{11} \div 5$	$\frac{12}{13} \div 6$	$\frac{8}{15} \div 4$	$\frac{9}{16} \div 3$



4. $\frac{3}{4} \div 2 = ?$ $\frac{1}{2}$ of $\frac{3}{4} = ?$

5. Draw a circle, divide it into fifths, and answer these questions:

$$\frac{1}{5} \div 2 = ?$$

$$\frac{1}{5} \text{ of } \frac{3}{5} = ?$$

Multiplying the denominator of a fraction divides the fraction.

6. Divide by 2: $\frac{1}{4}$, $\frac{3}{5}$, $\frac{1}{7}$, $\frac{5}{8}$.

7. Divide by 3: $\frac{1}{2}$, $\frac{2}{5}$, $\frac{5}{8}$, $\frac{3}{5}$.

8. Divide by 5: $\frac{2}{5}$, $\frac{4}{7}$, $\frac{3}{8}$, $\frac{7}{8}$.

To divide a fraction by an integer, either *divide the numerator by the integer or multiply the denominator by it.*

9. Find quotients:

$$\frac{5}{7} \div 2$$

$$\frac{5}{9} \div 4$$

$$\frac{12}{7} \div 3$$

$$\frac{21}{2} \div 7$$

$$\frac{10}{11} \div 9$$

$$\frac{15}{8} \div 5$$

$$\frac{7}{12} \div 5$$

$$\frac{8}{15} \div 3$$

10. Divide $2\frac{1}{7}$ by 5.

$$2\frac{1}{7} = \frac{15}{7}$$

$$\frac{15}{7} \div 5 = \frac{3}{7}$$

11. Reduce these mixed numbers to improper fractions and divide:

$$5\frac{1}{3} \div 8$$

$$4\frac{3}{4} \div 7$$

$$3\frac{3}{7} \div 4$$

$$4\frac{5}{8} \div 9$$

DIVIDING AN INTEGER BY A FRACTION

114. Oral Exercises.

1. Divide 1 by $\frac{2}{3}$.

$$1 \div \frac{2}{3} = \frac{3}{2} + \frac{3}{2}.$$

$$3 \text{ thirds} \div 2 \text{ thirds} = \frac{3}{2} = 1\frac{1}{2}.$$

$$\text{Or we may write it thus: } \frac{3}{2} \div \frac{2}{3} = \frac{3}{2} = 1\frac{1}{2}.$$

2. Divide 1 by $\frac{3}{4}$.

$$1 \div \frac{3}{4} = \frac{4}{3} + \frac{2}{3}.$$

$$4 \text{ fourths} \div 3 \text{ fourths} = \frac{4}{3} = 1\frac{1}{3}.$$

$$\text{Or } \frac{4}{3} \div \frac{3}{4} = \frac{4}{3} = 1\frac{1}{3}.$$

3. Divide 1 by
- $\frac{2}{3}$
- .

$$1 \div \frac{2}{3} = \frac{3}{2} \div \frac{2}{3} = \frac{3}{2} = 1\frac{1}{2}$$

4. Find quotients:
- $1 \div \frac{3}{7}$

$$1 \div \frac{5}{8}$$

$$1 \div \frac{7}{9}$$

$$1 \div \frac{2}{3} = \frac{3}{2}$$

$$1 \div \frac{3}{4} = \frac{4}{3}$$

$$1 \div \frac{2}{5} = \frac{5}{2}$$

$$1 \div \frac{3}{7} = \frac{7}{3}$$

In every case, we see that when 1 is divided by a fraction, the quotient is the divisor inverted.

To invert a fraction, we turn it upside down: $\frac{3}{2}$ is $\frac{2}{3}$ inverted. $\frac{4}{3}$ is $\frac{3}{4}$ inverted.

5. Divide 2 by
- $\frac{2}{3}$
- .

$$1 \div \frac{2}{3} = \frac{3}{2} \quad 2 \div \frac{2}{3} = 2 \times (1 \div \frac{2}{3}) = 2 \times \frac{3}{2} = \frac{6}{2} = 3.$$

6. Divide 3 by
- $\frac{3}{4}$
- .

$$1 \div \frac{3}{4} = \frac{4}{3} \quad 3 \div \frac{3}{4} = 3 \times (1 \div \frac{3}{4}) = 3 \times \frac{4}{3} = \frac{12}{3} = 4$$

7. Find quotients:

$$4 \div \frac{2}{3}$$

$$6 \div \frac{5}{8}$$

$$5 \div \frac{7}{9}$$

To divide an integer by a fraction, *invert the fraction and multiply*.

DIVIDING A FRACTION BY A FRACTION

115. Oral Exercises.

$$1. \quad \begin{array}{r} 2 \text{ fifths} \overline{) 4 \text{ fifths}} \\ 2 \end{array} \quad \frac{4}{5} \div \frac{2}{5} = ?$$

$$2. \quad \text{Divide 9 elevenths by 3 elevenths.} \quad \frac{9}{11} \div \frac{3}{11} = ?$$

3. Give answers:

$$\frac{4}{7} \div \frac{2}{7}$$

$$\frac{6}{7} \div \frac{3}{7}$$

$$\frac{6}{7} \div \frac{2}{7}$$

$$\frac{10}{13} \div \frac{5}{13}$$

$$\frac{12}{13} \div \frac{6}{13}$$

$$\frac{8}{15} \div \frac{4}{15}$$

$$4. \quad \begin{array}{r} 2 \text{ fifths} \overline{) 3 \text{ fifths}} \\ ? \end{array}$$

$$\frac{3}{5} \div \frac{2}{5} = ?$$

5. Give answers :

$$\frac{4}{5} \div \frac{3}{8}$$

$$\frac{5}{7} \div \frac{2}{7}$$

$$\frac{7}{8} \div \frac{5}{8}$$

$$\frac{7}{8} \div \frac{3}{8}$$

$$\frac{5}{8} \div \frac{2}{8}$$

$$\frac{5}{11} \div \frac{3}{11}$$

6. Divide $\frac{7}{10}$ by $\frac{2}{5}$.

$$\frac{2}{5} = \frac{4}{10} \quad \frac{7}{10} \div \frac{2}{5} = \frac{7}{10} \div \frac{4}{10} = \frac{7}{4} = 1\frac{3}{4}$$

7. Divide $\frac{2}{3}$ by $\frac{1}{2}$.

$$\frac{2}{3} = \frac{4}{6} \quad \frac{1}{2} = \frac{3}{6} \quad \frac{2}{3} \div \frac{1}{2} = \frac{4}{6} \div \frac{3}{6} = \frac{4}{3} = 1\frac{1}{3}$$

To divide a fraction by a fraction, *change both fractions to fractions with a common denominator and divide the numerator of the dividend by the numerator of the divisor.*

8. Divide $\frac{2}{3}$ by $\frac{2}{3}$.

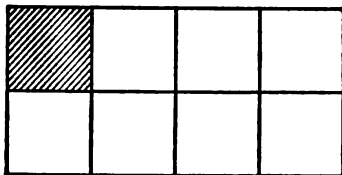
$$\frac{2}{3} = \frac{2}{3} \quad \frac{2}{3} = \frac{2}{3} \quad \frac{2}{3} \div \frac{2}{3} = \frac{2}{3} = 1\frac{1}{3}$$

We get the same result by inverting the divisor and multiplying :

$$\frac{2}{3} \div \frac{2}{3} = \frac{2}{3} \times \frac{3}{2} = \frac{6}{6} = 1\frac{1}{3}$$

To divide a fraction by a fraction, *invert the divisor and multiply.*

9. $\frac{1}{2} \div \frac{1}{8} = ?$



10. How many squares are there in $\frac{1}{2}$ of the above rectangle?

11. How many squares in $\frac{1}{8}$ of the above rectangle?

12. Draw a similar rectangle. Cut out one of the squares and find out how many times this square, or $\frac{1}{8}$ of the rectangle, is contained in $\frac{1}{2}$ of the rectangle.

$$\frac{1}{2} \div \frac{1}{8} = ?$$

We get the same result by inverting the divisor $\frac{1}{8}$ and proceeding as in multiplication.

$$\frac{1}{2} \div \frac{1}{8} = \frac{1}{2} \times \frac{8}{1} = 4$$

116. Oral Exercises.

1. Give answers at sight:

$\frac{3}{4} \div \frac{1}{2}$	$\frac{2}{3} \div \frac{1}{3}$	$\frac{2}{3} \div \frac{1}{2}$	$\frac{1}{4} \div \frac{1}{8}$	$\frac{3}{4} \div \frac{3}{8}$
$\frac{3}{10} \div \frac{1}{5}$	$\frac{7}{10} \div \frac{1}{2}$	$\frac{5}{6} \div \frac{1}{3}$	$\frac{4}{5} \div \frac{2}{3}$	$\frac{5}{8} \div \frac{5}{7}$
$9 \div \frac{1}{2}$	$6 \div \frac{2}{3}$	$8 \div \frac{4}{5}$	$12 \div \frac{3}{4}$	$18 \div \frac{9}{7}$
$\frac{4}{5} \div 3$	$\frac{5}{9} \div 10$	$\frac{2}{3} \div 12$	$\frac{7}{8} \div 7$	$\frac{10}{11} \div 5$

2. Change the mixed numbers in the following examples to improper fractions, and give answers at sight:

$\frac{1}{3} \div 1\frac{1}{3}$	$1\frac{1}{2} \div \frac{1}{2}$	$2\frac{1}{2} \div \frac{1}{8}$	$\frac{5}{8} \div 1\frac{1}{8}$
$1\frac{1}{3} \div \frac{1}{6}$	$\frac{4}{9} \div 1\frac{1}{3}$	$\frac{3}{4} \div 1\frac{1}{4}$	$1\frac{1}{8} \div \frac{5}{8}$
$1\frac{1}{2} \div 1\frac{1}{2}$	$\frac{1}{2} \div 1\frac{1}{2}$	$1\frac{1}{4} \div \frac{3}{4}$	$\frac{3}{10} \div 1\frac{1}{5}$
$\frac{1}{5} \div 1\frac{1}{5}$	$1\frac{1}{5} \div \frac{1}{5}$	$\frac{1}{8} \div 2\frac{1}{2}$	$\frac{5}{12} \div 3\frac{1}{3}$

117. Written Exercises.

1. $4\frac{1}{2} \div 1\frac{2}{3}$	5. $17\frac{1}{2} \div 8\frac{1}{5}$	9. $8\frac{3}{5} \div 17\frac{1}{4}$	13. $3\frac{2}{3} \div 5\frac{2}{3}$
2. $3\frac{6}{7} \div 1\frac{2}{7}$	6. $6\frac{2}{3} \div 2\frac{3}{10}$	10. $\frac{17}{81} \div \frac{8}{9}$	14. $2\frac{9}{16} \div 3\frac{1}{8}$
3. $7\frac{2}{3} \div 2\frac{1}{4}$	7. $5\frac{3}{4} \div 7\frac{1}{8}$	11. $3\frac{5}{8} \div 8\frac{2}{7}$	15. $3\frac{7}{8} \div 5\frac{5}{8}$
4. $9\frac{7}{8} \div 2\frac{1}{4}$	8. $16 \div 7\frac{1}{2}$	12. $10\frac{10}{11} \div 2\frac{2}{4}$	16. $12\frac{1}{4} \div 2\frac{3}{14}$
17. $(\frac{1}{3} \times \frac{1}{2}) \div (\frac{1}{6} \times \frac{1}{8})$	20. $(\frac{3}{10} \times \frac{35}{8}) \div (\frac{7}{4} \times 2\frac{5}{8})$		
18. $(\frac{3}{5} \times \frac{1}{5}) \div (\frac{2}{7} \times \frac{1}{8})$	21. $(\frac{5}{7} \times 4\frac{2}{3}) \div (\frac{8}{9} \times 5\frac{2}{3})$		
19. $(\frac{4}{5} \times 1\frac{1}{2}) \div (\frac{2}{9} \times 2\frac{7}{8})$	22. $(\frac{3}{8} \times 5\frac{2}{3}) \div (\frac{1}{5} \times 3\frac{1}{5})$		

SHORT METHOD OF DIVIDING A MIXED NUMBER BY AN INTEGER

118. Oral Exercises.

1. Divide $24\frac{2}{7}$ by 2.

$$\begin{array}{r} 2)24\frac{2}{7} \\ \underline{12\frac{1}{7}} \end{array}$$

$12\frac{1}{7}$ Ans.

$$24 \div 2 = 12$$

$$\frac{2}{7} \div 2 = \frac{1}{7}$$

2. Give answers at sight:

$$3)36\frac{2}{3}$$

$$5)45\frac{5}{8}$$

$$6)42\frac{8}{11}$$

$$7)49\frac{7}{8}$$

$$8)56\frac{8}{11}$$

$$9)63\frac{9}{11}$$

3. Divide $27\frac{1}{2}$ by 3.

$$\begin{array}{r} 3)27\frac{1}{2} \\ \underline{9\frac{1}{6}} \end{array}$$

$9\frac{1}{6}$ Ans.

$$27 \div 3 = 9$$

$$\frac{1}{2} \div 3 = \frac{1}{6}$$

4. Give answers at sight:

$$5)25\frac{1}{3}$$

$$4)32\frac{1}{5}$$

$$2)18\frac{2}{7}$$

$$6)30\frac{1}{7}$$

$$7)35\frac{2}{7}$$

$$8)40\frac{2}{11}$$

5. Divide $19\frac{1}{5}$ by 4.

$4)19\frac{1}{5}$ 19 divided by 4 gives 4 and 3 over. Change the 3 to fifths ($\frac{3}{5}$) and add it to the fraction $\frac{1}{5}$, which gives $\frac{4}{5}$. Divide $\frac{4}{5}$ by 4, which gives $\frac{1}{5}$, or $\frac{1}{5}$.

119. Written Exercises.

1. $9)20\frac{1}{2}$

3. $7)99\frac{2}{3}$

5. $4)485\frac{1}{8}$

7. $8)169\frac{2}{3}$

2. $9)81\frac{2}{3}$

4. $8)65\frac{7}{8}$

6. $5)66\frac{1}{2}$

8. $3)298\frac{1}{8}$

9. $73\frac{5}{8} \div 9$

11. $122\frac{1}{3} \div 6$

13. $156\frac{2}{3} \div 7$

10. $70\frac{1}{7} \div 5$

12. $98\frac{2}{5} \div 8$

14. $89\frac{5}{8} \div 4$

BILLS

120. Written Exercises.

Make bills for the following purchases. Supply dates and names. Receipt the bills.

1. 12 lb. sugar @ $6\frac{1}{2}\text{¢}$
5 lb. coffee @ 35¢
8 doz. eggs @ 56¢
2 bbl. flour @ \$5.75
2. 6 chairs @ \$2.15
30 yd. carpet @ \$1.80
1 dining room table @ \$17.00
10 china plates @ 24¢
3. 1 suit clothes @ \$15.50
3 undershirts @ 90¢
3 neckties @ 75¢
6 collars @ $12\frac{1}{2}\text{¢}$
4. 12 gal. syrup @ 40¢
2 bbl. sugar @ \$22.50
50 lb. lard @ 11¢
100 lb. beef @ 15¢

121. Oral Problems.

Give answers at sight :

1. What part of a dollar is 10¢ ? 25¢ ? $33\frac{1}{3}\text{¢}$? 50¢ ? $66\frac{2}{3}\text{¢}$? 75¢ ?
2. At \$.25 a yard, what will 16 yd. of cambric cost?
3. At \$.50 a yard, what will $10\frac{1}{2}$ yd. of rice cloth cost?
4. At \$.75 a yard, what will 24 yd. of silk cost?

5. At $\$.33\frac{1}{3}$ a gallon, what will 12 gal. of vinegar cost?
6. At $\$.66\frac{2}{3}$ a bushel, what will 15 bu. of potatoes cost?
7. At $\$.10$ a quart, what will 19 qt. of onions cost?
8. At $\$.25$ a pound, what will 32 oz. of coffee cost?
9. At $\$.50$ a half pound, what will $5\frac{1}{2}$ lb. of tea cost?
10. At $\$.75$ for $\frac{3}{4}$ of a yard, what will $\frac{1}{4}$ yd. of serge cost?

122. Oral Problems.

1. If $2\frac{1}{4}$ yd. of braid cost 36¢, what will 1 yd. cost?
2. At the rate of 36 cents for $\frac{1}{2}$ yd., how much will $1\frac{1}{8}$ yd. of ribbon cost?
3. Father caught 24 fish. Mother cooked 6 of them and gave away the others. What part of the catch did she cook? What part did she give away?
4. A rectangle is 9 inches long and 3 inches wide. What fractional part of the length is the width?
5. In this rectangle, how does the length compare with the width?
6. A cook had 2 lb. of spice and used 8 oz. of it. What part of her supply did she use?
7. The butcher had 56 lb. of chopped meat. He sold 21 lb. to a restaurant. What part of his chopped meat did he sell to the restaurant?
8. A girl received an order for 3 dozen sleeves. In one day she made 28 sleeves. What part of the order did she make that day?
9. Mother bought 2 doz. eggs and used 18 of them for making cake. What part of her purchase did she use?
10. Copper sheathing weighs 10 oz. to the square foot. What fraction of a pound is this?

11. What will 24 sq. ft. of this sheathing (Ex. 10) weigh?
12. If a sheet of this sheathing weighs 40 pounds, how many square feet does it contain?
13. A woman bought $\frac{3}{4}$ lb. of meat at 16 cents a pound. She used $\frac{1}{3}$ of it for soup. What was the cost of the meat that she used for soup?

WAGES; EXPENSES; SAVINGS

Give answers at sight:

14. A man's wages are \$80 a month. He pays \$20 a month for rent. What part of his wages goes for rent?
15. He uses $\frac{2}{3}$ of the remainder for household expenses. How much does he use for household expenses? How much then remains?
16. He puts $\frac{2}{3}$ of the remainder in the bank. How much does he put in the bank?
17. If he puts a like amount in the bank each month, how much will he put away in a year?
18. The remainder he uses for personal expenses. What is the amount of his personal expense?

RATIO

123. Oral Problems.

1. What part of 36 is 12? 12 is how many times 3?
 2. If 36 yd. of cloth cost \$69, what will 12 yd. cost?
- Comparing 12 with 36, we find that 12 is $\frac{1}{3}$ of 36. If 36 yd. cost \$69, 12 yd. will cost $\frac{1}{3}$ of \$69.
3. At the rate of 3 for a dollar, how much will 12 neckties cost?
- Comparing 12 with 3, we find that 12 is 4 times 3. If 3 neckties cost 1 dollar, 12 neckties will cost 4 times 1 dollar.

4. If 28 yd. of cloth cost \$60, what will 7 yd. cost?
5. If 27 yd. of cloth cost \$48, what will 9 yd. cost?
6. If 9 yd. of lace cost $1\frac{2}{3}$, what will 27 yd. cost?
7. If $\frac{1}{2}$ ton of coal costs \$3.50, what will $\frac{1}{4}$ ton cost?
8. At the rate of 3 for 4¢, how many pears can be bought for 16¢?
9. A man paid 48¢ for apples. At the rate of 5 for 12¢, how many apples did he buy?
10. When the grocer sells 7 lb. of flour for \$.18, how many pounds can I buy for \$.54?
11. At the rate of 3 cans for \$.25, how many cans of peaches can I buy for \$2.25?
12. When $3\frac{1}{2}$ lb. of sugar cost 21¢, how much must I pay for 14 lb.?
13. If 2 collars cost \$.25, how much will 18 collars cost?
14. If 2 collars cost \$.25, how many collars can I buy for \$1.50?
15. $5\frac{1}{2}$ cups of sugar are used in 3 cakes. At this rate, how many cups of sugar will be used in 18 cakes?
16. 5 dozen eggs cost \$2.50. What will 20 dozen cost at the same rate?
17. If it takes $2\frac{1}{2}$ spoonfuls of coffee to make 2 cups of coffee, how many spoonfuls of coffee will it take to make 8 cups?

124. Written Problems.

1. A merchant had 4 lengths of silk, each containing $12\frac{3}{4}$ yd. With this silk he made skirts, using $5\frac{1}{10}$ yd. for each skirt. How many skirts did he make?
2. At the rate of 32¢ for $\frac{1}{4}$ yd., how much will $\frac{5}{8}$ yd. of lace cost?

3. How many pounds of rice, at $8\frac{1}{4}\text{¢}$ a pound, can I buy for 66¢?

4. A grocer sold sugar at the rate of $3\frac{1}{2}$ lb. for 21 cents. How much did he receive for 630 lb.?

5. A girl had $27\frac{3}{4}$ yd. of ribbon. She cut it into pieces $\frac{3}{4}$ yd. in length. Into how many pieces did she cut it?

6. At the rate of $40\frac{7}{10}$ miles an hour, in how many hours will a train travel $610\frac{1}{2}$ miles?

7. A dressmaker has $70\frac{3}{4}$ yd. of lace. How many waists can she trim if she uses $4\frac{3}{4}$ yd. for each waist?

8. If $\frac{1}{2}$ barrel of flour costs $\$3\frac{1}{2}$, what will $\frac{5}{8}$ of a barrel cost?

9. A grocer put up $37\frac{1}{2}$ lb. of tea in $\frac{1}{4}$ -pound packages. How many packages did he make?

10. A bookseller sells on an average 416 books a month. How long will it take him to sell a stock of 4,992 books?

11. At the rate of 197 miles a day, how long would it take to go from Buffalo to Duluth, a distance of 985 miles?

12. During January a manufacturer of wagons sold 135 wagons for \$48,330. During February he sold 75 wagons of the same kind. How much money did he receive for his February sales?

13. An army agent paid \$28,912 for 278 mules. How much did he pay for each mule?

14. A contractor paid \$1,650 for 15 horses. At this rate how many horses could he buy for \$13,200?

125. Written Exercises.

THE THEATER

1. A theater has seats for 1,500 people. $\frac{2}{3}$ of the seats are sold at \$2 each; $\frac{1}{3}$ of them at \$1.50 each; 200 seats at \$1 each; and the remainder at \$.75 each. All the seats were sold on Saturday night. How much was taken in at the box office?

2. On Friday night the following seats were unsold :

25 seats at \$2 each
100 seats at \$1.50 each
30 seats at \$1 each

What part of the full receipts was lost ?

3. What is the manager's profit for one night when the theater is full if he pays out $\frac{3}{5}$ of the receipts for salaries, $\frac{1}{10}$ for heat and lights, and $\frac{1}{10}$ for other expenses ?

SELLING EGGS

4. A farmer shipped his eggs to the city. He placed the smaller eggs in one crate, the larger eggs in another. If each crate holds 30 dozen, how many eggs are in a crate ?

5. If each of the larger eggs weighs just 2 ounces, how many pounds will 30 dozen weigh ?

6. Allowing 7 pounds for the weight of the crate and the packing, what will be the express charges on a crate of the larger eggs at $1\frac{1}{2}$ cents per pound ?

7. He sells a crate of these eggs to a grocer, the price being $2\frac{3}{4}$ cents per egg. What does the farmer receive for the 30 dozen eggs ?

8. The grocer pays the express charges. What is the entire cost to the grocer ?

9. Owing to carelessness on the part of the express company 96 eggs were broken. What part of the crate is this ? How many eggs were unbroken ?

10. The express company paid the grocer \$3.36 for the broken eggs. At this rate what did he receive for each broken egg ?

11. The unbroken eggs were sold for 60 cents a dozen. What was received for them ?

12. What was the entire amount received by the grocer for the eggs broken and unbroken? What was the entire amount expended by the grocer? What was his profit on this crate of eggs?

13. If the smaller eggs can be bought from the farmer for 5 cents less per dozen than was paid for the larger eggs, what will a crate of the smaller eggs be worth, expressage not considered?

MAKING DRESSES

14. A girl bought a remnant of fine cloth containing 8 yards for \$18, which was a reduction of \$8 on the piece. What was the regular price per yard? What was the cost per yard to her?

15. She used 5 yards to make a dress for herself. What did the piece used for her dress cost her?

16. Trimmings, lining, buttons, and thread cost her \$3.75. What did the finished dress cost her?

17. A dress of like quality would cost in the shop \$35. How much did she save by making her own dress? What fraction of the store cost was the cost found in Ex. 16 above?

18. Of the left-over piece she made a dress for her sister. What was the cost of this piece?

19. For the sister's dress there were bought lining, trimmings, buttons, and thread to the value of \$2.25. What was the cost of this dress when finished?

20. The store cost of a dress of like quality was \$18. What was the saving? What fraction of the shop cost was the actual cost?

21. What was the actual cost of both dresses together?

What was the store cost of dresses of like quality?

How much was saved on these two dresses?

22. What fraction of the store cost of both dresses was the actual cost?

126. Written Exercises.**THE COST OF PLASTERING A WALL**

1. A man employs a plasterer and a laborer to prepare and apply the material necessary for plastering 100 square yards of wall space in the attic of his house. How many square feet of surface are there?

2. There are to be two coats of plaster. The materials for the first coat are:

8 bushels of lime at 23¢ a bushel
16 lb. of hair at 4¢ a pound
 $1\frac{2}{3}$ tons of sand at \$1.35 a ton

Find the cost of the material for the first coat.

3. The material is mixed by the laborer, who gets $27\frac{1}{2}$ ¢ an hour for his work. If he works 4 hours, how much does he receive?

The material when mixed is applied by the plasterer, whose pay is 60¢ an hour. If he works 8 hours, how much does he receive? What is the entire cost of labor on the first coat?

4. What is the entire cost of the first coat?

5. For the second coat there are required:

$3\frac{1}{2}$ bushels of finishing lime at 36¢ a bushel
 $\frac{1}{2}$ barrel of plaster of Paris at \$2 per barrel
 $\frac{3}{8}$ bushel of white sand at 32¢ per bushel

Find the cost of the material for this coat.

6. What is the cost of labor if the laborer works 5 hours at $27\frac{1}{2}$ ¢ per hour, and the plasterer 18 hours at 60¢ per hour?

7. What is the total cost of this second coat?

8. Find the entire cost of the finished work.

THE MILKMAN

9. A man having \$350 started in the milk business. He bought a horse for \$175, a wagon for \$110, harness for \$35, and spent \$65 for crates, bottles, and other necessities. How much was he compelled to borrow in order to pay for all?

10. Being popular in his neighborhood he succeeded in getting 80 families who agreed to take one quart of milk a day, 53 who agreed to take 2 quarts a day, and 18 who agreed to take 3 quarts a day. How many quarts were needed to supply these families?

11. He received his milk in cans, each of which contained 40 quarts. How many cans of milk must he buy to supply the above demand?

12. The milk used was obtained at $6\frac{1}{2}$ cents a quart. What was the cost of the milk necessary to supply his customers for a week, or 7 days?

13. The expense of caring for his horse and wagon was \$1.25 a day; other expenses averaged \$.75 a day. How much did these expenses amount to in a week, or 7 days?

14. Including the cost of the milk, what were his total expenses for the week?

15. He sold his milk at 9 cents a quart. What was the amount of his daily sales? What was the amount of his sales for a week, or 7 days?

16. His horse being sick, he was compelled to hire a horse during the entire month of April at \$2 per day. Medical treatment for the sick horse cost him \$3 a week during April. How much added expense did he have for the month of April?

17. Had his own horse not been sick, his profit during April would have been \$4 a day. What would his profit for the entire month of April have amounted to? What was the actual profit?

18. Sales during the first year averaged 240 quarts a day. During the second year sales were $\frac{1}{4}$ greater than during the first year. What were the daily sales during the second year?

19. During the third year sales increased 60 quarts a day over the second year. What fraction of increase was this?

20. The man finds that he can sell 300 quarts more each day. If his profit is $2\frac{1}{2}$ cents per quart, would it pay him to start another route if he must pay a man \$2.50 a day to take care of it, and other expenses amount to \$2.25 a day? If so, what would be his daily profit?

COMPLETE MULTIPLICATION TABLE

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

Use the Complete Multiplication Table in the following manner:

We wish to know the product of 4 times 6.

Move a pencil down the first (left-hand) column until you come to 4 (fourth line).

Then move the pencil to the right along this line until you come to column 6, where you find 24, which is the product of 4 times 6.

TABLES OF MEASURES

TABLE OF TIME

60 seconds (sec.)	= 1 minute (min.)
60 minutes	= 1 hour (hr.)
24 hours	= 1 day (da.)
7 days	= 1 week (wk.)
365 days	= 1 common year (yr.)
366 days	= 1 leap year
12 months (mo.)	= 1 year

TABLE OF LENGTH

12 inches (in.)	= 1 foot (ft.)
3 feet	= 1 yard (yd.)
5½ yards	= 1 rod (rd.)
16½ feet	= 1 rod
320 rods	= 1 mile (mi.)
1,760 yards	= 1 mile
5,280 feet	= 1 mile

TABLE OF LIQUID MEASURE

4 gills (gi.)	= 1 pint (pt.)
2 pints	= 1 quart (qt.)
4 quarts	= 1 gallon (gal.)

TABLE OF WEIGHT

16 ounces (oz.)	= 1 pound (lb.)
100 pounds	= 1 hundredweight (cwt.)
20 hundredweight	= 1 ton (T.)
2,000 pounds	= 1 ton

TABLE OF DRY MEASURE

2 pints (pt.)	= 1 quart (qt.)
8 quarts	= 1 peck (pk.)
4 pecks	= 1 bushel (bu.)

UNITED STATES MONEY

10 mills	= 1 cent
10 cents	= 1 dime
10 dimes	= 1 dollar
10 dollars	= 1 eagle

TABLE OF SQUARE MEASURE

144 square inches (sq. in.)	= 1 square foot (sq. ft.)
9 square feet	= 1 square yard (sq. yd.)
30 $\frac{1}{2}$ square yards	= 1 square rod (sq. rd.)
160 square rods	= 1 acre (A.)
640 acres	= 1 square mile (sq. mi.)

